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A Linear Discriminant Analysis of Market Modes of Land Redistribution in Kwazulu-Natal from 1997-2002

A. Semalulu, M. Lyne and S. Ferrer

School of Agricultural Sciences and Agribusiness, University of KwaZulu-Natal

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Department of Agricultural and Applied Economics,
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Tel: (608) 262-5538
Email: basis-me@facstaff.wisc.edu
<http://www.basis.wisc.edu>

June 2004

A. Semalulu, M. Lyne and S. Ferrer

University of KwaZulu-Natal

lyne@ukzn.ac.za

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This output was made possible in part through support provided by the US Agency for International Development (USAID), under the terms of Grant No. LAG-A-00-96-90016-00, and by funding support from the BASIS Collaborative Research Support Program and its management entity, the Department of Agricultural and Applied Economics, University of Wisconsin-Madison, USA. All views, interpretations, recommendations, and conclusions expressed in this paper are those of the author(s) and not necessarily those of the supporting or cooperating organizations.

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Abstract

A linear discriminant model is used to identify farm and gender characteristics associated with three different market modes of land redistribution (transactions financed with government grants, own cash or mortgage loans) in KwaZulu-Natal using data drawn from deeds of transfer recorded over the period 1997-2002. The results indicate that land transactions co-financed by commercial banks transferred larger farms of better quality to previously disadvantaged South Africans relative to those financed exclusively by own cash or government grants. However, the gap between land transfers financed by the private sector and those financed by government grants narrowed considerably following the introduction of the Land Redistribution for Agriculture (LRAD) programme. LRAD offers larger grants to wealthier and more-creditworthy beneficiaries and is therefore conducive to establishing farms owned and operated by individuals or by small groups of individuals. This was not the case with the previous (SLAG) programme that encouraged models of collective land ownership that were not creditworthy and which discouraged beneficiaries from supplementing their grants with own savings to purchase better quality farmland. Early findings presented in this paper show that LRAD has succeeded in drawing private sector resources into the land reform process.

1. INTRODUCTION

Various modes of land redistribution have emerged in South Africa to redistribute farmland to previously disadvantaged people since democratisation in 1994. Between 1995 and 1999, an African National Congress (ANC)-led government initiated a land redistribution programme by offering Settlement/Land Acquisition Grants (SLAG) to previously disadvantaged South Africans to purchase formerly white-owned farms on a willing buyer-willing seller basis. Means testing applied to SLAG precluded individuals with a monthly household income greater than R1,500 (Lyne & Darroch, 2003). Consequently, the relatively wealthy had to purchase land privately. The objective of the grant programme was to redistribute 30 per cent of the country's commercial farmland to previously disadvantaged South Africans within five years (ANC, 1994). Up to the end of 2000 SLAG had transferred around 780,407 hectares to previously disadvantaged households, representing only three per cent of the 25 million hectares that the government had initially hoped to redistribute during this period (National Land Committee, 2000).

Upon taking over the Ministry of Agriculture and Land Affairs in June 1999, the honourable Thoko Didiza commissioned a sweeping review of the redistribution programme and imposed a moratorium on further Settlement/Land Acquisition Grants early in 2000. A new grant programme, entitled Land Redistribution for Agricultural Development (LRAD) was launched in August 2001 with a less ambitious objective of redistributing 30% of the country's agricultural land over 15 years (MALA, 2001). LRAD differs from SLAG in that there is no means test - beneficiaries do not have to be poor to qualify for a minimum grant of R20,000 and those who have more savings and who can raise bigger loans to finance their farms qualify for larger grants, the maximum grant being R100,000. This marks a distinct shift in the redistribution policy away from poverty alleviation and group settlement in favour of settling prospective farmers on their own farms. LRAD also aims to draw the private sector into land redistribution by encouraging aspiring farmers to leverage mortgage loans from financial institutions.

Few disadvantaged South Africans can afford to buy commercial farms of their own without mortgage loans. However, conventional mortgage loans amortized with constant payments of principal plus interest create severe cash flow (liquidity) problems for borrowers during the early years of their enterprise when inflation rates are high (Nieuwoudt & Vink, 1995). This temporary cash flow problem could be removed by providing a finite interest rate subsidy that diminishes at the expected rate of inflation over a finite period of time (Nieuwoudt & Vink, 1995). The subsidy allows for a below-market interest rate to be charged in the early years of the loan making it possible for the new farmer to meet his or her instalment payments from the limited cash flow earned by the enterprise during its early critical years. A variant of this graduated repayment concept has been used in KwaZulu-Natal by private sugar millers to sell farmland to emerging commercial farmers since 1995. Since its inception this scheme has helped approximately 142 emerging farmers to acquire medium-sized sugarcane farms in KwaZulu-Natal (Sunday Tribune, 2003).

The USAID sponsored BASIS Collaborative Research Support Programme has monitored government (SLAG) and private farmland transactions in the province of KwaZulu-Natal since 1997 (Graham & Lyne, 1999; Lyne & Darroch, 2003). Modes identified in census surveys of transfer deeds recorded in KwaZulu-Natal from 1997 to 2001 (Lyne & Darroch,

2003) were categorised as; government-assisted (ie. land transfers financed only with government settlement/land acquisition (SLAG) grants, private transfers (financed with mortgage loans or own cash) and private non-market transfers (mainly bequests and donations). In addition to these modes, the 2002 census survey identified land transfers co-financed with a combination of LRAD grants and mortgage loans (Ferrer & Semalulu, 2003).

Results of the annual census surveys show that farms financed only from government grants¹ transferred 73,745 hectares to previously disadvantaged households in KwaZulu-Natal over the period 1997-2002 whereas those financed with mortgage loans or own cash transferred 41,991 hectares and 44,542 hectares respectively (Ferrer & Semalulu, 2003). The quality of farmland financed with mortgage loans (R4,006/ha) or cash (R1,427/ha) was much higher than that purchased with government grants (R734/ha). On the other hand, the incidence of corporate ownership (where title is registered to a company, close corporation, trust or communal property association) was relatively low for transactions financed with own cash and mortgage loans. With respect to gender, men were well represented in transactions financed privately with mortgage loans, while women (as sole owners or married co-owners) were well represented in transactions financed with cash or with a mix of LRAD grants and mortgage loans (Ferrer & Semalulu, 2003).

This study uses discriminant analysis to identify farm and gender characteristics associated with the different market modes of land redistribution observed in KwaZulu-Natal over the period 1997-2002. Information about the relative strength and sign (positive or negative) of these partial relationships sheds light on the performance of these modes of land redistribution and what sets them apart. The next section describes the data and model used for the study while Section 3 presents the results of the discriminant analysis. The seminar ends with conclusions from the research topic.

2. RESEARCH METHOD

2.1 The data

Data for this study were drawn from transfer deeds analysed for the USAID-funded BASIS Collaborative Research Support Program during 1997-2002. The South African Deeds Registry maintains a database of all land transactions involving transfer of title. A transfer deed records information about the buyer, the seller, the area transacted, the region where the farm is located, the market price paid (unless the transfer was the result of bequest, donation or legal claim) and, where relevant, the size of mortgage loan(s) and name of the lender(s). The following variables were relevant to this analysis:

MODE OF LAND REDISTRIBUTION: Transfer deeds do not explicitly record the mode of redistribution except for non-market transactions and those financed with mortgage loans. Transactions involving farms purchased by a communal property association or community land trust were financed only with government grants. Transactions co-financed with LRAD

¹ Strictly speaking, farms financed 'only' from government grants may have been co-financed with some equity capital contributed by the beneficiaries, particularly after 2001 when LRAD replaced SLAG.

grants and mortgage loans were identified from lists provided by the lenders (Land Bank and Ithala Development Finance Corporation). The remaining market transactions were classified as own cash transactions.

Of the 1167 transactions that redistributed farmland to previously disadvantaged South Africans in KwaZulu-Natal during 1997-2002, 459 cases were excluded as they were non-market transfers. The remaining 708 transactions were categorised as; government grant only (n = 135), mortgage loan (n=200), LRAD plus mortgage loan (n=14) and own cash (n=359), The 'LRAD plus mortgage loan' transactions were then combined with the mortgage loan group because the former share the characteristics of private transactions co-financed with mortgage loans and own equity as they are assessed by commercial banks.

AREA: Hectares of land purchased by the new owner.

QUALITY: The quality of farmland purchased by the new owner was estimated as the price paid per hectare on the assumption that market prices accurately reflect the land's earning potential (Standard Bank, 1999:37-40).

REGION: Following Lyne & Ortmann (1996), KwaZulu-Natal was divided into three geographic zones, namely; the Coastal Belt, Midlands and Lowveld. The Lowveld accounts for a small part of the province and is typically located in river valleys that are remote from towns. Each observed market transaction was then allocated to one of these zones using location codes recorded on the transfer deed.

GENDER: The transfer deeds do not record the gender of new landowners. In the absence of this information, the gender of buyers who were natural persons was established primarily on the basis of their names. As noted by Lyne & Darroch (2003), this process is not entirely accurate for sole owners. However, in the case of married co-owners, the names of both the husband and wife are recorded making it easier to identify gender accurately.

2.2 Linear discriminant analysis (LDA)

LDA is a statistical technique used to distinguish between two or more groups using characteristics on which the groups are expected to differ (Manly, 1994: 107). Groups are forced to be as statistically different as possible by forming a weighted linear combination of the discriminating variables (SPSS, 1994). The weights are estimated so that they result in the 'best' separation between the groups.

A linear discriminant function can be represented as:

$$D_i = \beta_1 Z_{i1} + \beta_2 Z_{i2} + \dots + \beta_p Z_{ip}$$

where;

D_i is the score of the discriminant function for the i^{th} respondent,

β_p are the standardised weights or coefficients to be estimated,

Z_{ip} are the standardised values of the p discriminating variables.

The standardised weighting coefficients (β_p) reflect the relative importance of each discriminating variable (Z_{ip}). Variables with relatively larger β_p contribute more to the discrimination of groups. Two statistics are commonly used to gauge the importance of a discriminant function. The first is Wilks' Lambda, an inverse measure of the function's

discriminating power; the smaller the value of Wilks' Lambda the better the discriminating power of the function. The second is the correct classification rate. This shows how well the discriminant model predicts the actual group membership of the original observations. For a three-group study like this, only two discriminant functions can be extracted - with the first function accounting for the largest proportion of the differences among the three groups. Table 1 summarises the discriminating variables included in the analysis.

Table 1: Discriminating variables included in the analysis

Variable	Description
LN(AREA)	Natural log of farm size measured in hectares
LN(QUALITY)	Quality of farmland measured as the natural log of price paid per hectare (R/Ha) in constant 2000 Rands
(D₁₁)	Dummy variable scoring one if the farm purchased falls within the Coastal Belt or zero if located in the Midlands or Lowveld
(D₁₂)	Dummy variable scoring one if the farm purchased falls within the Midlands and zero if located in the Coastal Belt or Lowveld
(D₂₁)	Dummy variable scoring one if the new owner is a corporate entity and zero if a natural person or married couple
(D₂₂)	Dummy variable scoring one if the new owner is a male and zero if a corporate entity or woman as either sole owner or married co-owner

LN(AREA): Farms financed with government grants are expected to be larger in area than those financed with mortgage loans or own cash. Beneficiaries of the SLAG programme tended to purchase extensive but low quality farms because their main objective was to accommodate the residential and grazing needs of a large group of households by pooling their small grants (Turner & Ibsen, 2000:10-11). Farms purchased with own cash are expected to be amongst the smallest as few people, especially the previously disadvantaged, have sufficient savings to pay cash for a large farm. Low levels of equity capital are also expected to constrain the size of farms financed with mortgage loans because commercial banks usually require a debt/equity ratio of less than one. The variable AREA was transformed to natural logarithms to reduce skewness in its distribution.

LN(QUALITY): Farmland purchased with mortgage loans or own cash is expected to be of higher agricultural quality than land financed only from government grants - partly because groups of SLAG beneficiaries required large areas for residential and grazing purposes and partly because co-ownership of more expensive cropland created social problems in its allocation to individuals, or free-rider problems in its collective use (Lyne & Graham, 2001). The variable QUALITY - measured in terms of real price paid per hectare - was also transformed to natural logarithms to improve the symmetry of its distribution.

REGION: Regional dummies were included to capture bias in the location of public and private land redistribution programmes. For example, it is well documented that the SLAG programme was piloted in the Midlands and Lowveld of KwaZulu-Natal near the towns of Estcourt and Weenen owing to conflict between commercial farmers and labour tenants, and that the medium-scale sugarcane farmer programme subsidised by private sugar millers is located in the Coastal Belt (Graham, 2000). Two regional dummy variables (D_{11} and D_{12}) were included in the analysis to distinguish transactions in the Coastal and Midlands regions from those in the Lowveld - the default category.

GENDER: Two 'gender' dummies account for three categories of owner. Dummy variable D_{21} scores a one if the buyer is a corporate entity, and zero otherwise. D_{22} scores a one if the buyer is a male as sole owner, and zero otherwise. The default category is therefore comprised of women as sole owners or married co-owners. The incidence of corporate ownership is expected to be highest for farms financed only from government grants. Under the SLAG programme, beneficiaries had to pool their small grants and purchase farms collectively in order to avoid the high costs of surveying and registering subdivisions. However, the Subdivision of Agricultural Land Act, Act 70 of 1970, prohibits co-ownership of farmland in undivided shares by natural persons other than husband and wife. Consequently, each beneficiary group had to establish a juristic entity, usually a communal property association or a community land trust, to take ownership of the land. According to the DLA (2001) women are under-represented in these corporate entities. For farms financed with own cash or mortgage loans, the incidence of female ownership is expected to be relatively low as previously disadvantaged women typically lack savings and creditworthiness as a result of discriminatory customs and social practices (DLA, 1997). In addition, the contractual status of women married under customary law before 1998 was limited to a legal state of perpetual minority. Under the Recognition of Customary Marriages Act, Act 120 of 1998, a customary marriage entrenches equality and, unless stated in an ante-nuptial contract, is a marriage in community of property (DHA, 2000).

3. RESULTS

The descriptive statistics presented in Table 2 show significant univariate differences in the mean values of all the discriminating variables. The direction of these differences is consistent with *a priori* expectations.

Table 2: Mean farm and gender characteristics by mode of redistribution in KwaZulu-Natal, 1997-2002

Variable	Own cash	Mortgage including mortgage + LRAD	Government grant only	F-value
Cases	(333)	(210)	(129)	
LN(AREA)	3.41	4.48	5.62	93.90 ^{***}
LN(QUALITY)	7.81	8.59	6.71	86.41 ^{***}
D₁₁	0.39	0.37	0.25	6.06 ^{***}
D₁₂	0.54	0.49	0.72	9.23 ^{***}
D₂₁	0.22	0.21	1.00	233.87 ^{***}
D₂₂	0.47	0.50	0.00	60.18 ^{***}

^{***} implies significance at the one per cent level of probability

Discriminant functions were estimated with SPSS v11.5 (2002) using a stepwise procedure that entered explanatory variables only if they were statistically significant at the 20 per cent level of probability or better. Collinearity between discriminating variables did not appear to be a problem as the lowest tolerance level for any of the variables was 0.74. Results of the analysis are presented in Table 3.

Function 1 accounts for 68 per cent of the differences among the three modes of redistribution, while Function 2 accounts for 32 per cent. Wilk's Lambda is statistically significant for both functions. Together, these functions reduce Wilk's Lambda to 0.37 and correctly classify 71 per cent of transactions financed with own cash, 71 per cent of transactions financed with mortgage loans, and 92 per cent of farms purchased with government grants when prior probabilities of group membership are set equal to group size. The overall rate of correct classification is 75 per cent, indicating that a considerable amount of discriminatory information is accounted for by the discriminatory variables.

Table 3: Estimated discriminant functions and group means distinguishing three different modes of land redistribution, 1997-2002.

Discriminating Variable	Standardised Coefficients		Mode of land redistribution	Group centroids	
	Function 1 'pre 2000'	Function 2 '2000'		Function 1 'pre-2000'	Function 2 '2000'
LN(QUALITY)	0.71***	0.89***	Mortgage including LRAD + mortgage	0.90	0.74
LN(AREA)	0.42***	1.17***			
D₁₁	-0.15	-0.28	Government grant only	-1.81	0.47
D₁₂	-0.11	-0.37			
D₂₁	-0.91***	0.14***	Own cash	0.14	-0.65
% of variance	68.00		32.00		
Wilks' Lambda	0.53***		0.70***		

*** implies significance at the one per cent level of probability.

According to the magnitude and signs of the standardised coefficients estimated for significant variables in the first discriminant function, it is clear that larger farms of better quality tend to be purchased by individual owners rather than by groups registered as a corporate entity. The group centroids suggest that this function distinguishes farms financed with government grants from those financed with mortgage loans or (to a lesser extent) cash reserves over the period 1997-2001 when the SLAG programme discouraged private investment by creating models of collective ownership that did not establish conditions for efficient land use or creditworthiness (Lyne & Graham, 2001; Graham & Darroch, 2001).

The significant coefficients estimated for Function 2 show a strengthening of the positive relationship between farm size and quality, and a weak positive relationship with corporate ownership. In this case, the group centroids suggest that Function 2 is characterised mainly by transactions in 2002 when SLAG was replaced by LRAD. Under LRAD, corporate ownership tends to be characterised by small groups with benefit rights proportional to individual investment rather than large groups of land reform beneficiaries sharing equal rights to use the land. A narrowing of the gap between the centroids predicted for loan and grant financed transactions suggests that LRAD beneficiaries who did not raise mortgage loans might have invested substantial savings of their own to purchase larger and better quality farms. This outcome was unlikely under SLAG owing to the means test and free-rider problems created by the type of collective action that SLAG entrenched.

Interestingly, there is no significant relationship between mode of land redistribution and the gender of natural persons who used their own cash or mortgage loans to finance family farms. Also, there appears to be no significant relationship between geographic location and mode redistribution, but this might be due to inadequate measures of location that do not accurately capture differences in access to grant and loan finance.

4. CONCLUSION

The study used discriminant analysis to identify variables associated with three different market modes of land redistribution (transactions financed with government grants, own cash or mortgage loans) in KwaZulu-Natal using data drawn from deeds of transfer recorded over the period 1997-2002. Results indicate that transactions financed by commercial banks transferred larger farms of better quality to emerging farmers than did those financed solely from own cash or government grants. However, the gap between transactions financed by the private sector and those financed only with government grants narrowed considerably following the introduction of LRAD in 2002. Before 2002, when the SLAG programme was in operation, beneficiaries tended to pool their grants in order to finance a relatively small farm of low quality. Ownership of the farm was usually registered to a community land trust or CPA. While there is evidence that women are not well represented in these corporate entities, this study shows no gender bias in the use of cash or private mortgage loans to finance family farms. Location, too, does not appear to be associated with any particular mode of redistribution, but this might only reflect poorly defined measures of location that do not adequately capture differences in access to grant and loan finance.

The relative failure of the SLAG programme in terms of transferring larger farms of better quality to emerging farmers is attributed to two main reasons: First, the programme specifically targeted relatively poor beneficiaries that did not have sufficient savings of their own to co-finance farmland. Second, it encouraged models of collective farm ownership that entrenched free-rider problems, and consequently did not establish conditions for creditworthiness or effective land use management. LRAD, on the other hand, offers larger grants to wealthier farmers and is therefore conducive to establishing farms owned and operated by individuals or by small groups of individuals. This not only improves creditworthiness, but also creates incentives for beneficiaries to invest their own savings in the enterprise. The early findings presented in this paper show that LRAD has succeeded drawing much-needed private resources into the land reform process.

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