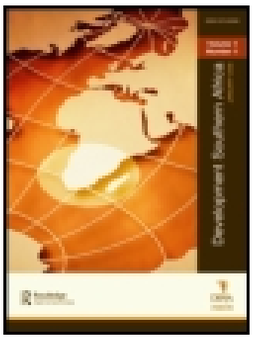

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The determinants of rural and urban household poverty in the North West province of South Africa

Philip Serumaga-Zake & Willem Naudé[1]

Based on standard poverty measures, the extent of poverty in the North West province is on average worse than in South Africa. For instance, the poverty gap ratio for North West is twice that of the South African average, and the FGT index is three times as high. This article therefore aims to identify the determinants of rural and urban poverty in the North West province of South Africa. Using data gathered from a survey of 593 black households across the province, probit model estimates suggest that the major significant determinants of household poverty in both rural and urban areas are education and household size. A difference between rural and urban poverty is, first, that extra female adults in a rural household raise the probability of poverty. Secondly, having a migrant (out) worker as head of the household in rural areas lowers the probability of poverty, while this does not apply to urban households. A sensitivity analysis for the robustness of the results over a range of poverty lines reveals that the impact of education is much stronger for poorer households than for more wealthy households.

1. INTRODUCTION

According to the new South African Constitution of 1996, provincial governments are responsible primarily for anti-poverty strategies through their provision of education, health and welfare services. Given the extent of income inequality and the significant differences in economic structure between provinces, econometric analyses of household level data on provincial level in South Africa may contribute to the design of regionally relevant anti-poverty strategies.

So far there have been a few attempts to analyse these determinants for South Africa as a whole (e.g. Donaldson, 1986; Donaldson & Roux, 1990; Pillay, 1991; Moll, 1992; Hofmeyr, 1995, 1997). Similar analyses focusing on a particular province have, however, been lacking until now.

In this light, the present study focuses on the determinants of poverty in the North West province of South Africa, a province characterised by significant poverty, inequality and a lack of statistics, particularly in large areas of the province that belonged to the former Bophuthatswana 'homeland'.

The data were obtained from a household survey that was specially conducted by the authors in 1997. The research assesses empirically the effects of human capital, region of residence and other specific household characteristics on the poverty status of households. The poverty estimates are based on per capita consumption expenditure

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(PCE) as a measure of household welfare. (The PCE figures were calculated by dividing total monthly household expenditure by their corresponding household sizes. It includes imputed values for consumption of home-produced food.) The welfare measure based on expenditure rather than income is favoured because the difficulties of measuring income are much more severe than those of measuring consumption, especially for the self-employed.

The article is structured as follows: Section 2 explains the methodology used; thereafter the results are presented in Section 3. Section 4 offers conclusions.

2. METHODOLOGY

2.1 Data

Multi-stage stratified cluster sampling was used to select a representative sample of 700 households to be interviewed. The households in North West province were divided into non-overlapping groups (strata) that were more homogeneous as far as socio-economic status was concerned than the population as a whole. The variables used were the geographical area in which a household was situated and household income (i.e. poorest 40 per cent, households in the 41–70 per cent percentiles, households in the 71–90 per cent percentiles and the richest 10 per cent) roughly estimated from the value of the dwelling in which a household was residing.

The size of the subsample drawn from a stratum was taken in proportion to the size of the stratum (i.e. proportional stratified sampling). Systematic sampling was then carried out within the strata to select the households to be interviewed. A total of 593 black households were interviewed across the province. The limitation of the survey was that some male heads of households (i.e. migrant workers) lived at their places of work in urban areas and came home only on weekends or/and public holidays. This may have distorted the results as far as total household expenditure figures are concerned.

2.2 Poverty measures in the North West province

Poverty can be measured by the headcount ratio, poverty gap, Sen's (1976) measure or the Foster, Greer & Thorbeche (FGT) (1984) measure. These measures of poverty are discussed briefly below, and their estimates for the North West province provided.

2.2.1 Headcount ratio

If the poverty line is denoted by z, and the welfare measure is x, then the headcount ratio is:

$$P_o = 1/N \sum_{i=1}^{N} 1(x_i \leq z) \quad \ldots\ldots (1)$$

where N is the population and $1(x_i \leq z)$ is an indicator factor that is 1 if its argument is true, and 0 otherwise. The sum of the indicators on the right-hand side of 1 is the number of people in poverty, so that P_o is simply the fraction of people in poverty. The headcount ratio has the disadvantage of taking no account of the degree of poverty. For example, it is not affected by a policy that can make the poor even poorer (Deaton, 1998).

2.2.2 Poverty gap

The poverty gap is:

$$P_1 = 1/N \sum_{i=1}^{N} (1 - x_i/z)1(x_i \leq z) \quad \ldots\ldots (2)$$

This is a better poverty measure than the headcount ratio, because in this case the contribution of an individual i to the aggregate poverty is larger the poorer i is. P_1 can be interpreted as a per capita measure of the total shortfall of an individual welfare below the poverty line, so it is the sum of all the shortfalls divided by the population and expressed as a ratio of the poverty line itself. Unlike the headcount ratio, the poverty gap will increase by transfers from poor to non-poor or from poor to less poor. However, transfers among the poor have no effect on this measure of poverty.

2.2.3 Sen measure

The Sen measure of poverty, which is a better measure than the poverty gap, is defined as:

$$P_s = P_o(1 - (1 - \gamma^p)\mu^p/z) \quad \ldots\ldots (3)$$

where μ^p is the mean of x among the poor and γ^p is the Gini coefficient of inequality among the poor, calculated by treating the poor as the whole population.

2.2.4 Foster, Greer & Thorbecke measure

The FGT measure of poverty is:

$$P_\alpha = 1/N \sum_{i=1}^{N} (1 - x_i/z)^\alpha 1(x_i \leq z) \quad \ldots\ldots (4)$$

so that P_o and P_1 are special cases corresponding to values for α of 0 and 1, respectively. The larger the value of α, the more the measure penalises the poverty gap. The commonly used measure of $\alpha = 2$ yields a poverty measure that is sensitive to distribution among the poor. If sectors are denoted by s, and there are S of them,

$$P_\alpha = 1/N \sum_{s=1}^{S} \sum (1 - x_j/z)^\alpha 1(x_j \leq z)$$

$$= \sum (n_s/N)P_\alpha^s \quad \ldots\ldots (5)$$

where n_s is the number of people in sector s and P_α^s is the FGT index of poverty within the sector.

2.2.5 Poverty measure estimates for North West

Table 1 shows the mean household expenditure, mean household size, PCE on a household basis and an individual basis, and standard error for mean individual-level PCE in the North West province. The average welfare on an individual basis is calculated by assigning the household levels of PCE to each individual and then averaging over the individuals. The table indicates that the mean total household expenditure in North West is R4 837,52 and the PCEs are R985,63 and R767,956 for households and individuals respectively. The Gini coefficient is 0,626, which compares

Table 1: Consumption measures per month, 1997

Mean total household expenditure	Mean household size	Mean PCE (household basis)	Mean PCE (individual basis)	Standard error
4 837,52	6,24	985,63	767,96	53,86

Note: PCE = per capita consumption expenditure.
Source: Calculated from the survey data.

favourably with that of 0,680 obtained for the whole of South Africa by Whiteford et al (1995).

Table 2 contains estimates of the four measures of poverty discussed in Section 2.2, namely the headcount ratio, poverty gap, FGT index and Sen poverty index. The first row gives poverty measures calculated in this study and the second row shows those obtained by Deaton (1998) for the whole of South Africa, for comparison. Following Deaton (1998), the North West measures are based on household PCE attributed to individuals and are calculated on an individual basis. A Gini coefficient of 0,243 (for the poor population) was used to calculate the FGT index and Sen index. The poverty headcount ratio is 0,382, which means that almost 40 per cent of blacks in the province have less than the poverty cut-off point. The FGT index is 0,121. This is composed of the FGT of 0,026 for illiterates; 0,060 for primary school leavers; 0,023 for those with middle schooling and 0,021 for high school leavers – implying that the poor are concentrated among the less educated. The poverty measures are seemingly higher than those for the whole of South Africa. For example, the headcount ratio for South Africa was found to be 0,317 by Deaton (1998).

Table 3 shows other descriptive statistics by welfare quartile. It is indicated that generally *age, gender, child15, madults, fadults, elderly, location (Klerksdorp)* and *rural mean values* decrease while those for *education, land, own, Rustenburg, Eastern, urban* and *ftype3* increase with increasing household expenditure. For example, the mean ages corresponding to PCE figures, R57,64; R139,91; R310,69 and R1 147,65 are 50,1; 52,8; 47,98 and 41,45 years respectively. The corresponding mean years of schooling are 27,5; 24,19; 28,24 and 27,09 respectively. This suggests that better educated households in the North West province are less likely to be poor than the less educated ones.

Table 2: Measures of individual poverty in the North West province, 1997

	Head count ratio (P0)	Poverty gap ratio (P1)	FGT index (P2)	Sen poverty index (Ps)
North West	0,382	0,200	0,121	0,245
South Africa, 93	0,317	0,106	0,049	0,144

Sources: Survey data and Deaton (1998).

Table 3: Descriptive statistics by welfare quartile*

Variable	Bottom mean Std dev.**	Lower middle mean Std dev.	Upper middle mean Std dev.	Top mean Std dev.
Pcapita	57,637 (20,56)	139,905 (33,57)	310,687 (70,93)	1147,65 (807,00)
Age	50,145 (16,49)	52,758 (17,13)	47,984 (13,71)	41,448 (12,71)
Educ	27,504 (15,77)	24,194 (14,19)	28,242 (16,52)	27,190 (14,02)
Gender	0,379 (0,49)	0,492 (0,50)	0,226 (0,42)	0,280 (0,45)
Childs15	2,857 (2,26)	1,903 (1,79)	1,500 (1,57)	1,073 (1,45)
Madults	2,294 (1,59)	1,621 (1,20)	1,621 (1,09)	1,400 (0,92)
Fadults	2,904 (1,60)	2,323 (1,32)	1,984 (1,12)	1,520 (1,08)
Elderly	0,328 (0,52)	0,315 (0,53)	0,145 (0,38)	0,040 (0,20)
Land	0,863 (0,35)	0,876 (0,33)	0,835 (0,37)	0,950 (0,22)
Own	0,015 (0,12)	0,041 (0,20)	0,041 (0,20)	0,164 (0,37)
Migrant	0,813 (0,39)	0,919 (0,27)	0,884 (0,32)	0,811 (0,39)
Central	0,221 (0,42)	0,282 (0,45)	0,218 (0,41)	0,384 (0,49)
Klerksdorp	0,366 (0,48)	0,363 (0,48)	0,242 (0,43)	0,168 (0,38)
Rustenburg	0,062 (0,24)	0,065 (0,25)	0,097 (0,30)	0,128 (0,34)
Eastern	0,090 (0,29)	0,113 (0,32)	0,194 (0,40)	0,224 (0,42)
Urban	0,228 (0,42)	0,371 (0,49)	0,355 (0,48)	0,532 (0,50)
Semiubn	0,241 (0,43)	0,282 (0,45)	0,339 (0,48)	0,344 (0,48)
Rural	0,531 (0,50)	0,347 (0,48)	0,306 (0,46)	0,120 (0,33)
Ftype1	0,444 (0,50)	0,320 (0,47)	0,293 (0,46)	0,287 (0,45)
Ftype2	0,556 (0,50)	0,664 (0,47)	0,672 (0,47)	0,579 (0,50)
Ftype3	–	0,016 (0,13)	0,034 (0,18)	0,132 (0,34)

Notes:

*Welfare is measured by per capita consumption expenditure.

**Std dev. = standard deviation.

Source: Calculated from the survey data.

2.3 Model specification

Since our concern in this article is to identify the factors that determine the probability whether or not a particular household in North West falls below or above the poverty line (measure), we need to estimate a binary response model. The specifications used most often for such models are the probit and logit models, which yield similar results (Nyaga & Capps, 1992).

In this article we will use a probit specification. The probability of observing a household in North West with an income (PCE) below the poverty line is defined in terms of a single unobserved index, and the standard cumulative normal distribution is used to transform the index into the probability value. The relationship is:

$$P \text{ (below poverty line)} = 1/\sqrt{2\Pi} \int_{-\infty}^{I} \exp(-\mu^2)/2 \, du$$

where P is the probability of observing a household below the poverty line. The index (I) can take any value between $-\infty$ and $+\infty$, but the transformation process ensures that all corresponding probability values lie between 0 and 1.

A binary response model (poor/non-poor) will be estimated by probit as follows: consider the following regression equation:

$$y_i = \beta x_i + \varepsilon_i \quad (6)$$

where y_i is household expenditure per capita for household i, β is a vector of parameters, x_i is a vector of household characteristics and ε_i is the error term, which is assumed to be normally distributed. One can then define a binary variable as:

$s_i = 1$ if $y_i \leq z$, $s_i = 0$ otherwise

where z is the poverty line. The binary model then becomes:

$$\text{Prob}\ (s_i = 1) = \text{F}(z - \beta x_i) \quad 6(a)$$

where F is the cumulative normal probability function.

A shortcoming of this binary model is that it collapses the information on the distribution of expenditure into two values. The technique also imposes constant parameters over the entire distribution and is unusual in that there is no latent variable that generates an observed binary variable, which is normally the basis for applying a probit model (Grootaert, 1997). In this study, the variable is derived from an observed continuous variable.

Because of the problem with the arbitrariness of the poverty line as discussed in Section 2.2 above, a sensitivity analysis is done in Section 3 to test for robustness of the results over a range of poverty lines (see Grootaert, 1997). Different poverty lines may give different coefficients on explanatory variables for the following reasons. The returns on major assets such as land and education may be different for the poor and non-poor. For example, the poor normally face harsher constraints on borrowing and on insuring against risks, so that their returns to endowments are relatively low. They may have little access to formal employment and, hence, lower returns to education as they mostly reside in rural areas. For purposes of the regression in Section 3, the basic poverty line is set at the 'median' value of a (monthly) PCE of R207.

2.4 Definitions of variables used in the study

The definitions of the explanatory variables used in the poverty regressions are given in Table 4. Human capital is captured by a number of variables, namely age of the household head, education of the members of the household, gender of the household head, number of children under the age of 15, male adults, female adults and the elderly in the household. The age variable captures work experience, while the square age variable deals with the stage in the life cycle of a household. The education variable includes the years of schooling of all the members of a household except children still in school. It is assumed that a year of education is of an equal value regardless of school, curriculum and time period when schooling took place. Education is considered a significant determinant of household welfare.

Gender and migrant status are regarded as sources of labour market segmentation and discrimination (Hofmeyr, 1997). The reasons for this include rigid division of labour owing to social customs, norms and beliefs that circumscribe individual behaviour, and the household responsibilities of women, which outweigh those of men. Earnings of female-headed households are therefore likely to be lower than those of male-headed ones. Conventionally, migration is considered one of the forms of human capital

Table 4: Definitions of the variables used in the study

Variable	Definition
Age	Age of the head of household in years
Sqage	Age squared
Educ	Sum of all the years of education of all household members excluding children still in school
Gender	Gender = 0 for a male head of household but gender = 1 for a female
child15	Number of children under the age of 15
madults	Number of male adults in the household
fadults	Number of female adults in the household
elderly	Number of elderly people in the household
land	Land = 0 for access to land but land = 1 for no access to land
own	Own = 0 for owning the dwelling in which the household is residing but own = 1 for not owning it
migrant	Migrant = 0 for a migrant head of household but migrant = 0 for a non-migrant
Huhudi	Huhudi region (i.e. Huhudi, Kudumane, Vryburg and Pokwane magisterial districts)
Central	Central region (i.e. Mmabatho, Madikwe, Lichtenburg and Delareyville magisterial districts)
Klerksdorp	Klerksdorp region (i.e. Schweizer-Reneke, Wolmaranstad, Christiana, Klerksdorp, Ventersdorp and Potchefstroom magisterial districts)
Rustenburg	Rustenburg region (i.e. Mankwe and Rustenburg magisterial districts)
Eastern	Eastern region (i.e. Brits, Ga-Rankuwa and Temba magisterial districts)
Urban	Urban area of residence
Semiubn	Semi-urban area of residence
Rural	Rural area of residence
Ftype1	Extended family
Ftype2	Nuclear family
Ftype3	Single family unit

because people move in search of better jobs. Household composition may also affect total expenditure owing to the possible differences in the required amounts of calories for men, women and children.

Wealthier households tend to be associated with higher earnings. The rich are more likely to take investment risks and they normally incur lower interest rates than the poor. Hence, land ownership or access to land and a categorical variable indicating whether the household owns the home it lives in, are included in the regression. Land ownership is considered an important indicator of the household's potential to generate income through own account activities (Grootaert, 1997). A house, as an asset, may contribute indirectly to the generation of income, both as a shelter and as a collateral for borrowing. Furthermore, a house can be sold during bad times and repurchased in better times; hence, it serves a function of income smoothing over time (Grootaert, 1997).

Family type (i.e. single, nuclear family and extended family) may influence the household's potential for generating income. Smaller households are more likely to save money for investment than larger ones and, as a result, larger households tend to be poorer. Serumaga-Zake (1990), found that marital status tends to raise income through lowering labour turnover rates.

Because of the high positive relationship between area of residence and place of work (i.e. members of households, especially women, tend to work in the same areas they are living in), households in urban areas are likely to earn more than those in rural areas. The difference in earnings between urban and rural areas may be due to the difference in labour productivity, which is influenced by physical capital investment in relation to labour and level of technology. Other possible reasons for the difference in earnings are the difference in trade union membership, cultural traditionalism, work ethics, profit motive and personal accomplishment (Gabriel & Cornfield, 1995). Owing to better employment and business opportunities, the returns on endowments are likely to be higher in urban areas than in rural areas. For this reason, separate models are fitted for urban and rural areas in this study.

The Statistical Association Software (SAS) was adopted to analyse the data. The probability of being poor – i.e. Pr (poor = 0) – is modelled as a function of the independent variables and a cumulative normal distribution function is assumed for the probit model.

3. PROBIT ESTIMATION RESULTS

This section presents the probit results. The maximum likelihood estimates for the model in equation (6) for both rural and urban areas, using the probit procedure, are shown in Table 5. There is a discrepancy between the total number of observations and the number of observations actually used in the regressions because of missing values. The SAS package excludes any observation with a missing value. Coefficients with one asterisk are significant at the 10 per cent level of significance, those with two asterisks are significant at the 5 per cent level and those with three asterisks at the 1 per cent level. All statements made in this study with regard to significance refer to the 10 per cent level of significance.

3.1 Determinants of rural poverty

From the results in the first column of Table 5 it is clear that education is significantly and negatively correlated with poverty. A higher proportion of household members under the age of 15 increases the probability of being poor. Unlike for male adults, an extra female adult in a household adds to the probability of being poor. This could be an indication of gender discrimination in the North West province (see also Serumaga-Zake & Naudé, 2001). The same applies to the elderly. Having a migrant as household head decreases the likelihood of being poor.

3.2 Determinants of urban poverty

The results in the second column of Table 5 indicate that education is a major determinant of poverty in urban areas, having almost the same degree of importance as for the rural areas. Male and female adults equally increase the probability of being poor. This suggests a lower degree of gender discrimination in urban areas than in rural areas. Migration does not contribute significantly to household welfare in urban areas. The probit model for the urban sector is significant at a 5 per cent level of significance.

Two alternative probit models at poverty lines set at + 25 and − 25 per cent of the basic poverty line were estimated to test for dominance. The results are contained in

Table 5: Probit models

Variable	Rural Estimate coefficient	Urban Estimate coefficient
Intercept	0,538 (0,12)	− 6,567 (1,47E-7)
Age	0,034 (0,50)	− 0,046 (0,66)
Sqage	− 0,000 (0,77)	0,000 (0,48)
Educ	− 0,068 (16,97)***	− 0,061 (16,08)***
Gender	0,190 (0,36)	0,489 (2,28)
Childs15	0,239 (3,84)**	0,193 (1,83)
Madults	0,222 (1,93)	0,401 (4,33)**
Fadults	0,575 (9,56)***	0,379 (4,06)**
Elderly	0,722 (3,45)*	0,690 (1,58)
Land	− 0,054 (0,04)	7,254 (1,80E-7)
Own	− 0,463 (0,25)	0,150 (0,09)
Migrant	− 1,176 (4,64)**	0,099 (0,08)
Central	0,003 (0,00)	− 0,390 (0,82)
Klerksdorp	0,131 (0,16)	0,377 (1,08)
Rustenburg	–	− 0,101 (0,04)
Ftype2	− 0,190 (0,37)	− 0,310 (0,96)
Ftype3	− 1,232 (2,05)	− 1,349 (2,62)
Number	0 = 109	65
1 = 49	101	
Pearson chi-square	138,47	179,07**

Source: Calculated from the sample data.

Tables 6a and 6b. The results of the effect of education on poverty are dominant and robust, though for the urban sector the coefficient on the education variable at the higher poverty line is − 0,033 (significant at a 5 per cent level of significance) instead of − 0,061 (significant at a 1 per cent level of significance) (see Table 5). The results indicate that education decreases the household's probability of being poor regardless of the poverty line used, but the impact is much stronger for poorer households.

The results for the other explanatory variables seem to differ for the different poverty lines. This implies that the effect of a given explanatory variable, other than education, on poverty depends on the poverty line used. For example, by using the lower poverty line, being a nuclear family rather than an extended family decreases the probability of being poor for the rural sector. The variable is not significant in the case of the poverty line used in the study. For the urban sector, it is indicated that for the higher poverty line, the variable 'male adults' is not a significant determinant of poverty, while 'region of residence' is. Specifically, living in urban areas reduces households' probability of being poor at the higher poverty line.

4. CONCLUSIONS

The purpose of this article was to identify the determinants of rural and urban poverty in the North West province of South Africa. Based on a proportional stratified survey

Table 6a: Rural probit model (poverty line = R93): lower poverty line

Variables	Coefficient chi-square
Intercept	0,142 (0,01)
Age	0,018 (0,13)
Sqage	− 0,000 (0,43)
Educ	− 0,056 (16,19)***
Sex	− 0,156 (0,31)
Childs15	0,300 (6,76)***
Madults	0,202 (2,20)
Fadults	0,421 (7,10)***
Elderly	0,367 (1,47)
Land	0,259 (0,81)
Own	− 5,913 (1,05E-7)
Migrant	− 0,848 (3,28)*
Reg2	− 0,173 (0,31)
Reg3	0,349 (1,33)
Reg4	–
Ftype2	− 0,720 (6,29)**
Ftype3	− 6,415 (1,23E-7)
Number	= 67
	= 91
Pearson Chi-square	138,60

Source: Calculated from the survey data.

of 593 black households across the province, various standard poverty measures were calculated and a probit model estimated to find the determinants of household poverty.

Based on standard poverty measures, the extent of poverty is worse in North West than in South Africa on average. For instance, the poverty gap ratio for North West is twice as high as the South African average, and the FGT index three times as high.

The results from a probit estimation found that the major significant determinants of household poverty in both rural and urban areas are education and household size. Higher levels of education are associated with lower levels of poverty, while larger households tend to face a higher probability of being poor. Two significant differences between rural and urban poverty dynamics are, first, the finding that extra female adults in a household raise the probability of poverty. This suggests the likelihood of more significant gender discrimination in rural areas than in urban areas. Secondly, in rural areas having a migrant (out) worker as head of the household lowers the probability of poverty, while this does not apply to urban households.

Finally, a sensitivity analysis for the robustness of the results over a range of poverty lines established the robustness of education and household size as significant poverty determinants. The impact of education was also found to be much stronger for poorer households than for more wealthy households.

Table 6b: Urban probit models (poverty line = R456): higher poverty line

Variable	Estimate coefficient
Intercept	0,400 (0,07)
Age	− 0,021 (0,15)
Sqage	0,000 (0,34)
Educ	− 0,033 (6,45)**
Sex	− 0,158 (0,30)
Childs15	0,028 (0,05)
Madults	0,109 (0,39)
Fadults	0,450 (6,59)**
Elderly	0,569 (0,94)
Land	0,241 (0,07)
Own	− 0,297 (0,48)
Migrant	− 0,001 (0,00)
Reg2	− 0,824 (5,45)**
Reg3	0,115 (0,12)
Reg4	− 0,431 (1,08)
Ftype2	0,168 (0,35)
Ftype3	− 0,972 (2,03)
Number	0 = 105
	1 = 61
Pearson chi-square	169,60

Source: Calculated from the survey data.

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