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Determinants of labour force participation in the North West province of South Africa

Philip AE Serumaga-Zake & Willem A Naudé[1]

Based on data extracted from the 1995 October Household Survey of Statistics South Africa, this study has found that potential income is a major factor in labour force participation by African women in the North West province of South Africa. Other significant determinants of participation for both genders are age, education, region, marital status and relationship to the head of the household. The results imply that significant discrimination against African women still exists in the North West province, which partly explains the much lower participation rate for African women (64 per cent), compared with that of African men (86,5 per cent). The study supports the North West government's development strategy of developing human resources to eradicate poverty.

1. INTRODUCTION

In order to address the poverty problem, the North West provincial government adopted an economic development strategy on 27 November 1997, which focuses on developing human resources. In 1995, almost 30 per cent of the annual budget (about US$2 billion) was spent on primary and secondary education (Kuscus, 1995). Although poverty in the North West province may be alleviated if appropriate attention is given in policy making to the determinants of household earnings, a significant obstacle to poverty alleviation remains in the form of high unemployment (Naudé & Serumaga-Zake, 2001). Unless members of households can overcome the first 'hurdle' and enter the labour force, paying attention to earnings determinants alone might not be an optimal development strategy in South Africa.

The government lacks reliable information on the determinants and elasticities of labour force participation that is needed for formulating the right economic development strategies for poverty eradication. This study is an attempt to bridge this gap. Focusing on potential income, it is intended to investigate the determinants of labour force participation by Africans in the North West, a predominantly rural province with a low Human Development Index of 0,543 (Naudé, 1997). Data pertaining to the North West province were extracted from the 1995 October Household Survey (SSA, 1996).

Section 2 explains the methodology used. Thereafter the estimation results are presented and discussed in Section 3.

2. METHODOLOGY

2.1 Data

The October Household Survey is a yearly, multistratified cluster sample survey

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conducted by Statistics South Africa (Stats SA) on a wide range of socio-economic characteristics of households covering the whole of South Africa. The major limitation of the dataset of 1995 was that it contained clerical errors such as transposition of digits and errors arising from poor supervision and overhasty completion of the questionnaire (e.g. rounding-off of ages). Also, Stats SA used a precise figure – the midpoint of the interval earnings – for those respondents who had reported their earnings within an interval (Hofmeyr, 1995).

2.2 Model specification

The standard participation model derived from the conventional neoclassical theory of labour supply was used in this study, following Sprague (1994). According to the theory, an individual can vary his or her number of hours worked to maximise his or her utility. In real life, due to contractual agreements, this can be achieved in the long term only by moving between jobs that offer different amounts of working time per week (see Creedy & Thomas, 1982). An individual allocates his or her available time between leisure *(L)* and work, of which benefits can be summarised by the resulting real income, *C*. Thus, $C = w/p$, where w represents wage and p the price of consumer goods. The individual's preferences can then be represented by a utility function: $U = U(C, L)$, which he or she strives to maximise subject to a budget constraint. Workers' tastes and circumstances, such as the presence of children, are considered to affect the number of hours worked. Labour supply studies in the literature indicate that the presence of children younger than 15 years reduces the number of hours worked by married women. The constraints on the maximisation of utility include a finite number of hours in a week, which imposes a time constraint, and non-labour income (unearned income). The non-labour income consists of both positive income (i.e. rent, interest, profits, money transfers) and negative income (i.e. debts that have to be paid before one starts spending on consumer goods).

An increase in non-labour income has the effect of decreasing the number of hours worked provided leisure is regarded as a normal good. Changes in the wage rate have both income and substitution effects. For example, a rise in the wage rate caused by a change in the tax structure would have an income effect of increasing the leisure time. Because the price of leisure increases with a wage increase, there would be a substitution effect as well – work would be substituted for leisure, thereby increasing the number of hours worked. The net effect of the wage increase would depend on which effect is strongest. A price effect of increasing the number of hours worked results if the substitution effect outweighs the positive income effect.

In this study, labour market participants are unemployed job seekers, those in full-time and part-time employment (including the self-employed) and those temporarily absent from work due to illness. Non-participants include those in full-time education, discouraged workers, those in domestic activities and retired people. People decide whether or not to participate in the labour force, and potential wage rate and income are major determinants of this decision, according to Joll et al. (1983). For non-participants, the number of hours worked is zero.

According to Sprague (1994), the participation model states that individuals participate in the labour market if, and only if, the market wage offered exceeds their reservation wage. The reservation wage reflects the marginal rate of substitution between real income and leisure, evaluated at full leisure. The reservation wage is a function of

non-labour income, personal characteristics, such as age, education, marital status, ages of children and tastes. Thus we can write:

$$W_i^* = W^*(M_i, \eta_i) \tag{1}$$

where W_i^* is the reservation wage, M_i is a vector of observed characteristics including non-labour income, and η_i is an unobservable parameter summarising tastes.

The market wage on offer to individuals will depend on both institutional factors (such as union membership, type of occupation and industry of employment) and personal characteristics (such as human capital – schooling and experience), and thus:

$$W_i = W(Z_i, \xi_i) \tag{2}$$

where Z_i is a vector of observed characteristics and ξ an unobservable parameter reflecting innate ability, commitment and dedication, for example. Thus the individual participates if, and only if, $W_i > W_i^*$.

We do not observe W_i^*, but we can write down the model:

$$P_i = P(M_i, W_i, \eta_i) \tag{3}$$

$$W_i = W(Z_i, \xi_i) \tag{4}$$

where P_i denotes participation. Functions (3) and (4) constitute a structural model of labour force participation. If P_i is in index form, i.e. it equals 1 if the individual participates and 0 otherwise, then:

$$P_i = 1 \qquad \textit{if } W_i > W_i^*$$

$$P_i = 0 \qquad \textit{otherwise}$$

Suppose the wage and participation functions are linear, then:

$$P_i = W_i\alpha + \Sigma M_{ij}\delta_j + \eta_i \tag{5}$$

$$W_i = \Sigma Z_{ik}\mu_k + \xi_i \tag{6}$$

Then we can substitute for wages into the participation function, giving:

$$P_i = \Sigma X_{il}\beta_l - \varepsilon_i \tag{7}$$

where X contains variables from Z and M, and ε represents the pooled error term. This constitutes the reduced form model of labour force participation.

If we observe N individuals with l Xs and the events P_i, we can express the probability that an individual will participate in the labour market as follows:

$$\begin{aligned}\Pr(P_i = 1) &= \Pr(\varepsilon_i \leq \Sigma X_{il}\beta_l) \\ &= \int_{-\infty}^{\Sigma X_{il}\beta_l} f(t)dt \\ &= F(\Sigma X_{il}\beta_l)\end{aligned} \tag{8}$$

where f is the density function and F is the cumulative distribution function associated with ε. If we have a sample of N individuals of which the group J are observed to be participants and K non-participants, then the likelihood function of the observed sample is as follows:

$$L(\beta) = \prod_{j \in J}[F(\Sigma X_{jl}\beta_l)] \prod_{k \in K}[1 - F(\Sigma X_{kl}\beta_l)] \quad (9)$$

For the purposes of this study, we assume that ε is normally distributed with the mean zero and constant variance σ^2. The likelihood for the probit model

$$L(\beta) = \prod_{j \in J} \Phi\left[\frac{\Sigma X_{jl}\beta_l}{\sigma}\right]. \prod_{k \in K}\left[1 - \Phi\left[\frac{\Sigma X_{kl}\beta_l}{\sigma}\right]\right] \quad (10)$$

where Φ is the cumulative distribution function of the standardised normal distribution, can then be estimated by maximising the function with respect to β/σ.

Because data on wages exists only for those people who work, the expected value of the error term in the wage function, conditional on $P_i = 1$, is non-zero in the sample. Estimation of the wage function using Ordinary Least Squares (OLS) will then produce biased and inconsistent estimates of the coefficients. Heckman's (1979) estimation method can be used to obtain unbiased and consistent estimates of the coefficients of the explanatory variables in the wage function, as set out below.

Heckman's technique involves a two-stage procedure. In the first stage, the probability that an individual will participate in the labour market – determined according to a probit regression in which personal variables (e.g. wealth index, parents' education, relationship to the head of household, age and education) serve as the regressors – is estimated. From the probit results a selection variable, the inverse Mills ratio term, is created (see Greene, 1993:685). In the second stage, the wage function is re-estimated including the Mills ratio as a regressor by the OLS method to produce unbiased and consistent estimates of the coefficients. The estimated coefficient on the Mills ratio measures the sample selectivity effect as the covariance between the errors in the participation and wage function. The estimated coefficients from the wage function are used to generate an imputed wage, *W*, for each individual. *W* is then entered into the structural participation function (as potential income), which is estimated by maximum likelihood techniques. Education and qualification are not included in the structural probit model because they are seen to influence participation indirectly through the potential income proxied by the imputed wage. Education is considered to influence the urge and taste for work positively.

In general, although the participation rates of women are increasing, they are still lower than those for men (Fallon & Verry, 1988). This is due partly to the different cultural family responsibilities of men and women, which tend to favour men over women and are thought to be discriminatory towards women. Culturally, the woman's place is in the kitchen – women generally stay at home looking after the children, preparing food, cleaning the house, etc. while men go out to work. The trend of increasing participation rates may be attributed to better education and falling birth rates, according to Fallon & Verry (1988). For the abovementioned reasons, the analysis in this study was done separately for males and females to avoid gender distortions. The STATA statistical package was used to analyse the data. The definitions and means of the variables included in the regression equations are shown in Table 1.

3. ESTIMATION RESULTS

Table 2 shows the results of the reduced model of labour force participation. These results are similar to some of the previous findings, such as those by Sprague (1994)

Table 1: Definitions of variables and means

Variable	Description	Means	
		Males	**Females**
Participation	Workers, part-time workers, non-workers looking for work or those who are temporarily unable to work (part. = 0 for participants; but part. = 1 for non-participants)	0,135	0,361
Salary	Monthly wage in rands	493,534	256.319
Age	Age in completed years	36,776	36,333
Exp	Potential experience in years = age at the time of the survey minus years of schooling	21,510	21,055
Educ1	No education (excluded from the model)	0,144	0,149
Educ2	Standards 1–4 (primary school)	0,236	0,248
Educ3	Standards 5–7 (middle school)	0,325	0,318
Educ4	Standards 8–9	0,142	0,129
Educ5	Standard 10 (matriculation)	0,103	0,105
Educ6	Standards 7–10 plus professional qualification	0,050	0,051
Region1	Huhudi region (i.e. Ganyesa, Kudumane, Taung and Vryburg) (excluded from the model)	0,102	0,124
Region2	Part of the Central region belonging to the former Transvaal province (i.e. Marico, Lichtenburg, Coligny and Delareyville)	0,094	0,082

Region3	Part of the Central region belonging to the former Bophuthatswana (i.e. Molopo, Ditsobotla and Lehurushe)	0,151	0,174
Region4	Eastern region (i.e. Odi, Moletele and Brits)	0,215	0,223
Region5	Part of the Rustenburg region belonging to the former Bophuthatswana (i.e. Bafokeng, Madikwe and Mankwe)	0,133	0,111
Region6	Part of Rustenburg region belonging to the former Transvaal province (i.e. Rustenburg, Koster and Swartruggens)	0,048	0,040
Region7	Southern region (i.e. Klerksdorp, Potchefstroom, Bloemhof, Christiana, Ventersdorp, Wolmaransstad and Schweizer-Reinecke)	0,217	0,194
Marital1	Never married (excluded from the model)	0,419	0,391
Marital2	Married or living together	0,535	0,492
Marital3	Divorced/separated, or widower/widow	0,046	0,117
Relat1	Resident head or absent head of the household (excluded from the model)	0,642	0,242
Relat2	Wife or husband or partner	0,013	0,393
Relat3	Son or daughter	0,231	0,245
Relat4	Other relatives	0,112	0,119
Ownership	Household owning the dwelling in which it is residing (owning the dwelling = 0; not owning the dwelling = 1)	0,804	0,928

Table 2: Reduced model of participation

	Males		Females	
Variable	**Coefficient**	**Chi-square**	**Coefficient**	**Chi-square**
Intercept	− 0,621	2,32	− 0,874**	4,94
Age	0,072***	13,51	0,053***	8,23
Square age	− 0,001***	19,35	− 0,001**	5,69
Region2	0,823***	18,74	0,869***	25,97
Region3	0,293**	4,11	0,138	1,28
Region4	0,368***	7,41	0,286**	5,98
Region5	0,289*	3,56	0,086	0,40
Region6	1,362***	14,19	1,032***	11,53
Region7	0,707***	25,92	0,400***	10,74
Educ2	0,033	0,05	− 0,024	0,04
Educ3	0,051	0,13	0,051	0,17
Educ4	− 0,047	0,08	0,224	2,45
Educ5	0,263	2,03	0,310**	4,29
Educ6	0,444*	3,14	0,675***	12,96
Marital2	0,422***	9,31	− 0,396***	7,61
Marital3	0,704***	8,58	0,061	0,14
Relat2	− 1,330***	16,60	− 0,010	0,01
Relat3	− 1,467***	106,48	− 0,597***	19,18
Relat4	− 1,209***	52,33	− 0,643***	18,14
Ownership	0,046	0,13	− 0,149	0,90
No. 0	1 023		673	
No. 1	437		681	
LR Chi-square	1 194		1 707***	

Notes: Coefficient figures with one asterisk are significant at a 10 per cent level of significance, those with two asterisks are significant at 5 per cent, and those with three asterisks are significant at a 1 per cent level of significance. Significance statements are based on the 10 per cent level of significance.

and Joshi & Newell (1986). For both genders, age, region, education, marital status and relationship to the head of the household are significant determinants of participation in the labour force. The older a person becomes, the more likely he or she will participate, ceteris paribus. Regions with higher economic activity (such as Region 4) are associated with greater probabilities of participation. Matriculation and Standards 7–10 (Grades 9–12) plus professional qualifications increase the probability of participation, especially for females. As expected, the effect of marriage on participation is different between males and females. Unlike for males, in the case of females marriage reduces the probability of participation. For both genders, being related to the head of the household also reduces the likelihood of participation.

Table 3 shows the estimation results of the structural model of labour force participation. The coefficients associated with the variables are similar to those estimated in the reduced probit.

Table 3: Structural model of participation

	Males		Females	
Variable	**Wage**	**Participation**	**Wage**	**Participation**
Intercept	− 0,397*	0,109	0,960**	− 1,064***
	(− 1,78)	(0,07)	(2,34)	(9,34)
Exp	0,048***			
	(2,97)		0,026	
Square exp	− 0,001*		(1,32)	
	(− 1,80)		− 0,000	
Educ2	0,317***		(− 0,68)	
	(2,81)		0,004	
Educ3	0,838***		(0,02)	
	(8,00)		0,384*	
Educ4	1,368***		(1,92)	
	(10,36)		0,744***	
Educ5	2,003***		(3,23)	
	(13,49)		0,806***	
Educ6	2,499***		(3,50)	
	(14,07)		1,354***	
Mills ratio	0,653***		(5,33)	
	(4,63)		− 0,061	
Imputed LW		0,078	(− 0,23)	0,477***
		(0,86)		(23,40)
Age		0,096***		0,054***
		(20,84)		(9,57)
Square age		− 0,001***		− 0,001***
		(30,24)		(10,83)
Region2		0,409*		− 0,000
		(3,02)		(5,60E-6)
Region3		0,035		0,426***
		(0,05)		(14,98)
Region4		0,145		0,432***
		(0,95)		(17,19)
Region5		0,077		0,273**
		(0,22)		(4,87)
Region6		5,981		− 0,507***
		(1,30E-6)		(7,71)
Region7		0,424***		0,258**
		(7,26)		(6,13)
Marital2		0,316*		− 0,560***
		(2,87)		(17,31)
Marital3		0,612**		− 0,304*
		(4,10)		(3,69)
Relat2		− 1,870***		− 0,115
		(37,55)		(0,96)
Relat3		− 1,232***		− 0,146
		(42,82)		(1,17)
Relat4		− 1,199***		− 0,283**
		(33,75)		(3,85)
Ownship		0,019		− 0,031
		(0,01)		(0,047)
No.	663	1 304	331	1 109
Adjusted R-square	0,36		0,16	
LR Chi-square			900	2 102***

For males, the Mills ratio is significant with a positive coefficient, implying that the errors of the participation model and those of the wage function are correlated positively. This means that the unobserved factors of the decision (or probability) to participate, such as ability, attitude and commitment, do affect the wage of an African male positively. Hence, estimating a males' wage function by the OLS method without including the Mills ratio would bias the coefficients. Potential income does not contribute significantly to explaining the participation of males in the labour force.

For females we have the opposite scenario: while the Mills ratio does not influence the wage rate, the 'potential income' variable is significant and its inclusion improves the overall fit of the probit model greatly. This finding supports the neoclassical model of labour supply.

4. CONCLUSION

Based on data extracted from the 1995 October Household Survey, this study has found that potential income is a major determinant of labour force participation by African women in the North West. Other significant determinants for both genders are age, education, region, marital status and relationship to the head of the household. An interesting implication of these findings is that significant discrimination against African women still exists in the North West, which partly explains the much lower participation rate of African women (64 per cent), compared with that of African men (86,5 per cent).

These findings suggest the need for economic development strategies that favour women over men. The study supports the North West government's development strategy of developing human resources to eradicate poverty, since education has been found to be a significant determinant of labour force participation.

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