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The role of education and fertility in the participation and employment of African women in South Africa

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1. Introduction

In the 1990s a number of empirical studies closely examined unemployment in South Africa (Kingdon and Knight 2000, Wittenberg 1999, Dinkelman and Pirouz 2000). There has been far less work on labour participation itself. Winter (1997) provides a broad overview of participation patterns by race of males and females in South Africa and Bhorat and Leibbrandt (2001) do some preliminary modelling. This lack of detailed attention to participation in South Africa is in marked contrast to the international literature which has focussed plenty of energy on understanding male and female participation patterns as well as in addressing specific hypotheses regarding these patterns (Killingsworth 1983, Lazaro 1997, Maglad 1998). One of the key issues that has emerged is the interrelationship between child bearing, education and women's work decisions. This paper uses 1995 survey data to address the South African evidence on this issue.

The strong link between education and employment opportunities has been widely documented in economic literature. However, among women it is not always evident that the higher their educational attainment the more they participate in the labour market. Recent literature has suggested that fertility and investment in children have a significant influence on the pattern of women's employment (Lam and Duryea 1998). If better-educated women are displaying low fertility rates but are not participating highly in the labour force, a plausible explanation for this could be that increased schooling of parents leads to a trade-off between quantity and quality of children (Becker 1991). Thus parents reduce fertility at the same time that they increase investments in child quality. Assuming that schooling increases productivity in both the home and market sectors, the reservation and the market wage should rise with increased schooling. The increases in the productivity of women's time in home production may in turn cause reservation wages to rise as fast as market wages, especially at low levels of schooling. This may prevent increases in women's schooling from pulling women into the labour market, even if schooling leads to higher market wages.

Therefore, the effect of schooling on participation of women may be thought of as being driven by trade-offs along two sets of margins. The one margin is the race between home productivity and labour market productivity that drives the extent to which better-educated women are pulled into the labour force by higher wages. The other is the adjustment in child quality and quantity that results from the effects of schooling on home productivity (Lam & Duryea 1998).

The aim of this paper is to investigate the inter linkages between education, fertility, labour market participation, and employment. The above discussion serves to spell out possible underlying dynamics in observable behaviour. In moving to empirical work we first look at the distribution of schooling in South Africa. Included in this analysis will be a brief look at the differences in educational attainment between men and women as well as differences between different age categories and how these have changed over time. Then, an investigation of the relationship between schooling and fertility is carried out. The aim of this analysis is to ascertain the degree to which the widely documented view about the negative relationship between fertility and education holds among African women in South Africa. This will be followed by a look at the relationship between fertility and employment. It is anticipated that marital status will have a strong influence on the participation decision. Furthermore, age and number of children are two additional factors that are likely to play an important role in women's work patterns. A detailed analysis of the participation and employment of African women will form an important part of this study.

2. The data

The data used in this study was collected in the 1995 October Household survey. The survey covered 30 000 households and just above 100 000 individuals. It was conducted according to a two stage sample design, with ten households collected from each of 3 000 clusters. This is a fairly common method of sampling as it allows for increased efficiency in interviewing, and also the possibility of collecting community level information in individual clusters. Clustering of this nature will however generate groups of observations that cannot be considered wholly independent, as observations from the same cluster will tend to show a degree of homogeneity. There will therefore be an overstatement of independent observations in the sample, and as a consequence standard formulas will inherently underestimate the variance of parameters (Deaton 1997).

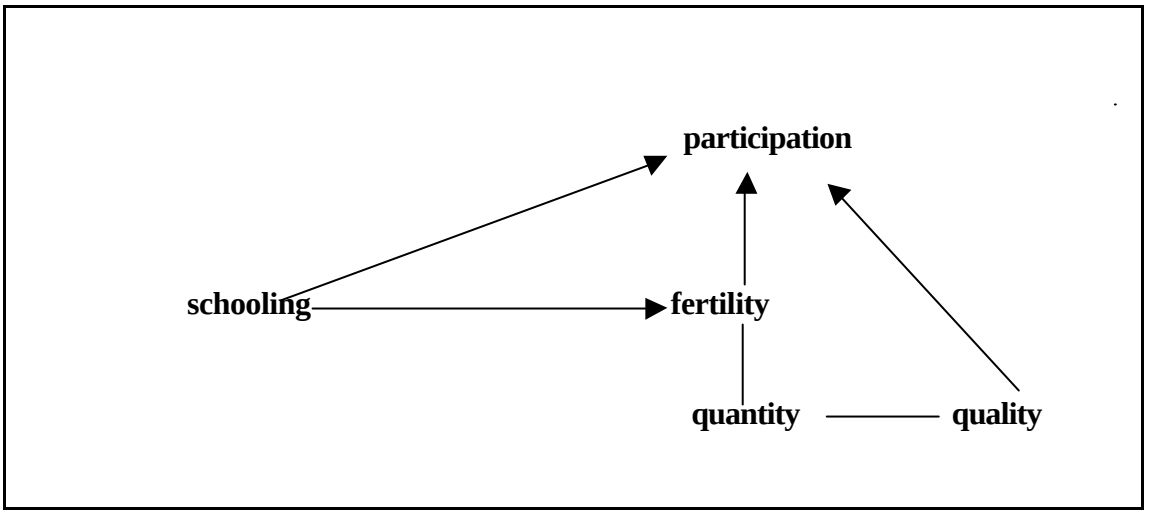
The OHS data set also has sample weights that enable scaling up of the sample to reflect the full population, and correct for over and under representation of certain types of households. Each observation has an attached weight that corresponds to the proportion of total population that this observation represents. Adjustments for both clustering and weighting have been used in this study. Furthermore, a number of observations were dropped as part of the data cleaning process[1].

Employment and participation were chosen as the two dependent variables. The main independent variables were education and fertility. Fertility, for the sake of the regression analysis, would be the number of children under the age of five. Other variables thought to influence the participation decision were marriage, location (rural or urban), the presence of other household income and age.

3. Preliminary analysis

The purpose of this section is to provide insight into the pattern of education, fertility and employment among African women, through basic data analysis. Figure 1 is a diagrammatic representation of the discussion presented in section 1.

Figure 1: The effect of Schooling and Fertility on Participation



Schooling has a positive effect on participation as evidenced by numerous studies (Lam & Duryea 1998, Becker 1991, Schultz 1993). By the same token, schooling is thought to have a

[1] *1991 census weights have been used in this study*

negative effect on fertility by reducing the quantity of children born. Ordinarily this effect on fertility would in turn lead to a positive effect on participation as women have less children and more time available for market work. However, it is plausible that the decrease in quantity of children be accompanied by an increase in desire for higher quality investment in these children. In such a case the reduction in number of children would not be accompanied by increased time available for market work. Lam and Duryea (1998) found this result in Brazil. We carry out a detailed investigation into the relationship between education and fertility, education and participation, and the three together in order to see whether this phenomenon exists in South Africa.

3.1 The distribution of schooling in South Africa

South Africa is characterised by vast inequalities between races, this is mainly as a result of its political history. These inequalities necessitate dealing with the different races separately. Another more common inequality is that which is found between women and men, and as a result it is also advisable to differentiate by gender. We have thus chosen to focus on the African race and to limit this study to women only. Our sample consists of 23 756 African women aged 16 to 54. This age range was chosen because of the fertility element in our analysis; questions regarding fertility were asked of women between these ages in the survey. Table 1 below displays some statistics regarding the distribution of schooling among African women and men who are included for the sake of comparison.

Table 1: Distribution of Years of Schooling for Cohorts Aged 16-54 - Africans

	Sample Size		Mean Schooling		Standard Deviation		% < 1 Year Educ.	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
16-19	3705	4165	6.29	6.75	2.37	2.22	2.08	1.71
20-24	3752	4421	7.33	7.39	2.94	2.91	3.70	4.03
25-29	2912	3791	6.80	6.88	3.51	3.50	6.30	7.53
30-34	2365	3090	6.14	6.10	3.68	3.70	8.48	11.07
35-39	2177	2824	5.70	5.39	3.62	3.65	10.01	14.65
40-44	1657	2123	4.89	4.47	3.59	3.60	15.41	20.87
45-49	1448	1876	4.31	3.93	3.62	3.33	20.28	26.05
50-54	1009	1466	3.85	3.28	3.49	3.22	25.71	35.08
Total	19025	23756	6.09	6.00	3.41	3.47	8.50	11.60

Looking at the mean schooling for both men and women it is noticeable that there is a steady increase in mean schooling as one moves from the older to younger cohorts. This steady rise begins at 3.85 and 3.28 for 50-54 year old men and women respectively and ends as high as 6.29 and 6.75 for those aged 16-19. However, it should be borne in mind that many of those falling in the 16-19 category are most likely still studying. A truer reflection of the mean schooling of African youth would therefore be given by the 20-24 age category. Table 1 also reflects the fact that the mean schooling for males was initially higher than that of females. This pattern is observed by looking at the 50-54 category up to the 30-34 category. Also noticeable within these five age-groups is that female gains in mean schooling have occurred at a faster rate than those of males. For instance, there was a 20% gain in mean schooling moving from the 50-54 cohort to the 45-49 cohort for women compared to a 12% gain for men. Similarly moving from the 35-39 category to the 30-34 category, female gains are 5% higher than that of men.

From the 25-29 cohort and younger, female mean schooling overtakes that of males. The lower female mean schooling for the older cohorts is likely to be the result of cultural factors. Traditionally the education of girls was seen as an activity that offered little rewards for the parents. The prevailing view was that a girl would at some stage marry and use that education to the benefit and enhancement of her husband's family rather than her own. It was believed that

men would use their education to uplift their homes. The change in views is reflected by the fact that for the youngest cohorts, 25-29 and younger, mean schooling for women is higher than that of males. Nevertheless, gender differences in mean schooling for Africans are not very high.

Furthermore, the last set of statistics in Table 1 show the percentage of men and women with less than one year of education within each age category. Once more we observe great improvements moving from the older to the younger cohorts. Of the oldest cohort, 26% of males and 35% of females have less than a year of education. Although the percentage of women with less than a year of education is greater than that of men for most of the categories, the female gains in education occur at a higher rate than that of males. Interestingly, the youngest cohort has a lower percentage of women than men with no formal schooling. Gender equality in educational attainment is likely to be the norm for future generations as women's rights gain wider recognition.

Delving further into the distribution of education among African women, Table 2 displays the percentage of women in each age category with a specified level of education[2]. For example, 12% of the women in the age category 50-54 have a standard 6 qualification whereas less than half a percent have a degree. Across-age-category comparisons can also be made. For example, close to 2% of the women aged 50-54 have a Matric (std 10) qualification whereas above 9% of those aged 35-39 have it.

Table 2: Distribution of Women's Schooling Within Age Categories

	30-34	35-39	40-44	45-49	50-54
0	11.68	15.19	22.19	24.95	34.38
1	3.72	4.96	6.26	7.25	6.07
2	5.76	5.91	6.41	6.66	7.44
3	5.89	5.84	6.55	7.2	7.09
4	6.57	7.9	8.9	9.59	8.32
5	9.16	10.94	10.98	10.23	9.48
6	8.38	10.69	12.48	15.19	12.35
7	8.32	6.69	4.71	4.26	3.96
8	10.42	10.59	7.68	5.76	5.25
9	6.12	4.85	2.68	2.13	1.09
10	15.15	9.28	5.18	3.09	1.91
11	0.84	0.85	0.75	0.48	0.41
12	6.5	4.96	3.91	2.4	1.84
13	1.49	1.35	1.32	0.8	0.41

Focusing attention on the shaded part of Table 2, 15% of women aged 50-54 have above a standard 6 level of education. This percentage improves to 19% for the 45-49 category; 26% for the 40-44 category; 39% for the 35-39 category; and 49% for the 30-34 category. The greatest gains in this range of education are observed when moving from the 40-44 age group to the 35-39 age group (13%) as well as moving from the 35-39 category to the 30-34 (10%). These gains are observed despite the fact that the sample sizes for these two categories are bigger than the rest. Stated differently, women born in 1955 and later have experienced vast improvements in educational attainment. Figure 2 displays this pattern most vividly.

[2] *In all instances education level refers to the standard e.g. level 5 refers to standard 5; level 10 refers to standard 10 (matric); level 11 and level 12 refer to diplomas and certificates; level 13 refers to degrees.*

Figure 2: Distribution of Educational Attainment within Age Categories

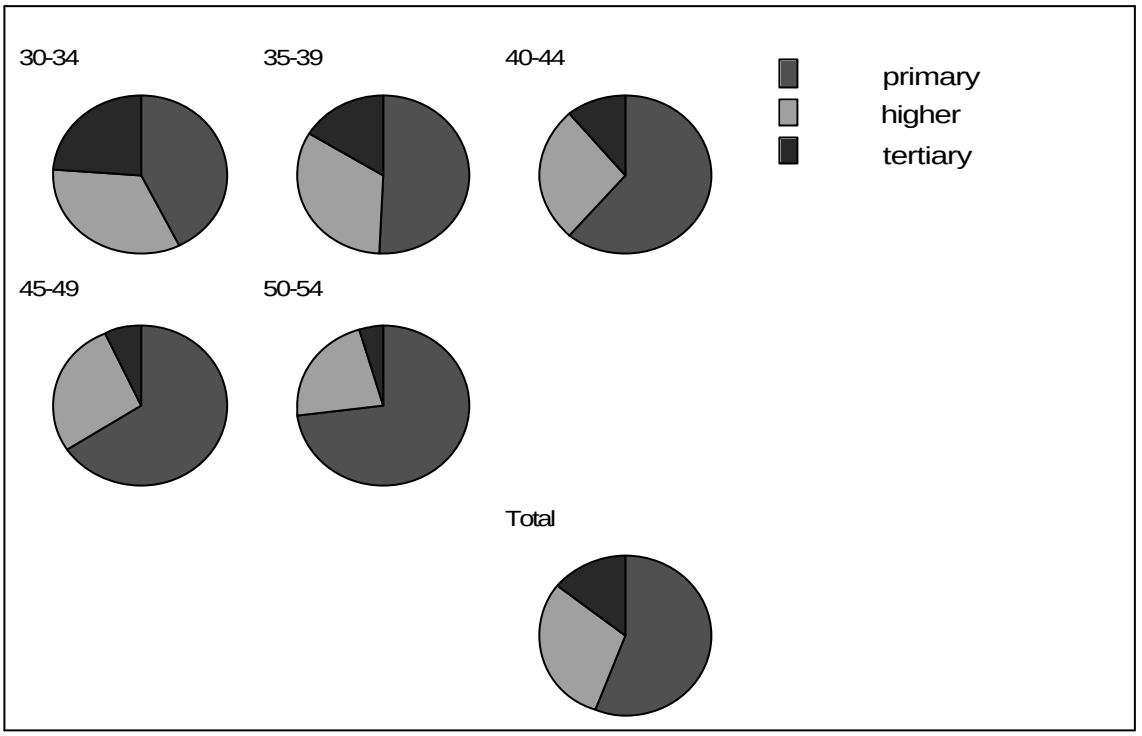
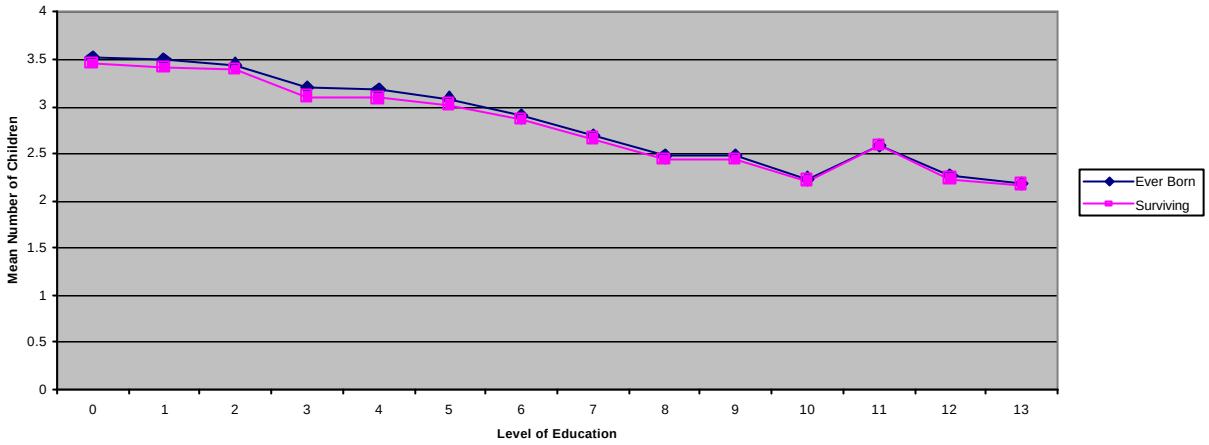


Figure 2 shows pie graphs divided into education levels for African women in each age category. It can be seen that 56% of all these women have primary education while 30% have higher education and 14% have tertiary. In this instance primary means 0-7 years of education, higher means 8-12 years education, and tertiary means a diploma or degree. When looking at the graphs starting with the oldest age category and moving towards the youngest, we see that the proportion of women with primary education decreases steadily whereas the proportions of the pies associated with women with higher and tertiary education increase steadily. A further investigation into the relationship between fertility and education for these women ought to yield interesting results and indeed it does.

3.2 Schooling and fertility in South Africa

Schooling is generally seen as beneficial in that it empowers women to better control the number of children they have to conform to the number they wish to have (Mason 1986). A sign of this empowerment is the reduction in child mortality that accompanies higher educational attainment of mothers. Figure 3 below shows the relationship between education, live births and the number of surviving children for all women aged 40 to 54.

Figure 3: Education, Number of Live Births and Number of Children Still Living at Time of Survey (Women 40-54)



This age category has been chosen with the view in mind that women over 40 generally have completed their childbearing. As can be seen in the diagram, the gap narrows between children ever born and those still living as educational attainment of mothers increases. The results of this analysis are more potent when children below the age of six are considered where the care of the mother has the greatest influence on the health of the child. As a result of the nature of the data, the age at which a child died cannot be determined accurately. However, the fact that the gap narrows with greater education of mothers shows that regardless of the age of children, mothers' education improves mortality rates of their children.

Table 3: Mean Number of Children by Age 30 by Education Level - Africans

	30-34	35-39	40-44	45-49	50-54	Total
0	2.00	2.44	2.35	2.12	1.97	2.18
1	2.40	2.74	2.57	2.24	1.81	2.42
2	1.98	2.40	2.36	2.40	2.13	2.24
3	2.06	2.35	2.18	2.06	2.15	2.16
4	2.20	2.31	2.28	2.05	1.90	2.19
5	1.84	2.28	2.36	2.09	2.25	2.14
6	1.84	2.12	2.30	1.99	1.91	2.04
7	1.72	1.91	1.90	1.85	1.91	1.82
8	1.77	1.93	2.20	1.79	1.93	1.90
9	1.57	1.98	1.96	2.18	1.69	1.80
10	1.71	1.75	2.19	2.09	1.65	1.79
11	1.83	1.58	2.00	2.00	1.00	1.78
12	1.47	1.82	2.03	1.47	1.42	1.66
13	1.55	1.93	1.96	2.27	2.25	1.83
Total	1.84	2.17	2.27	2.07	1.97	2.05

Table 3 shows the mean number of children born to women in each age category and education level by age thirty. Looking at the mean totals for each age group, a rise in mean number of births is observed when moving from the oldest age group up until the 40-44 age

category. The pattern then reverses for the next two age groups. The beginning of the decline in mean number of births coincides with the identified rise in educational attainment. That is, women born after 1955 display a pattern of falling fertility accompanied by rising educational attainment. This feature is most clearly depicted graphically in Figure 4. Figure 4 shows the mean number of births by the time the women reach 30 years of age. The interesting aspect of this analysis is observing the changing pattern in fertility over time.

Figure 4a: Mean Number of Births by Age 30 for the 45-49 and 50-54 Age Categories

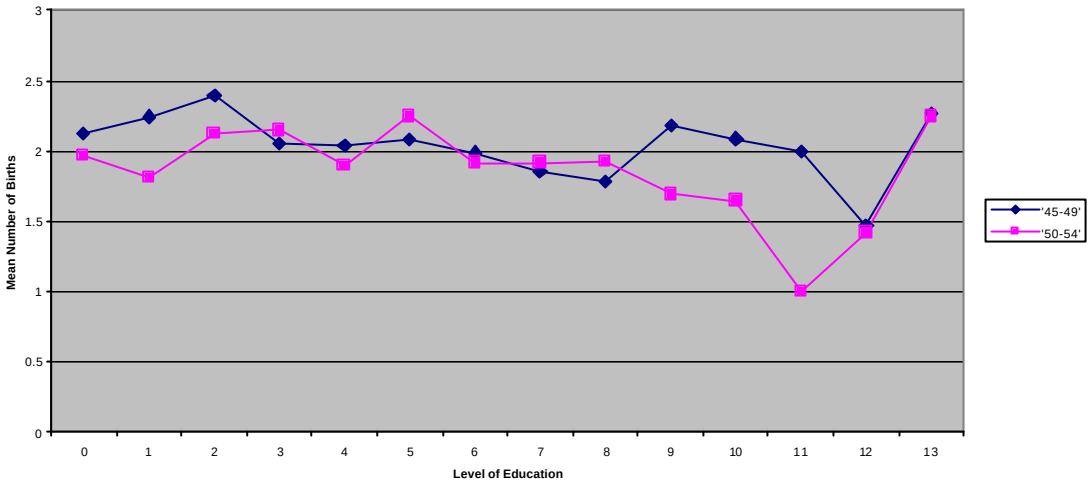
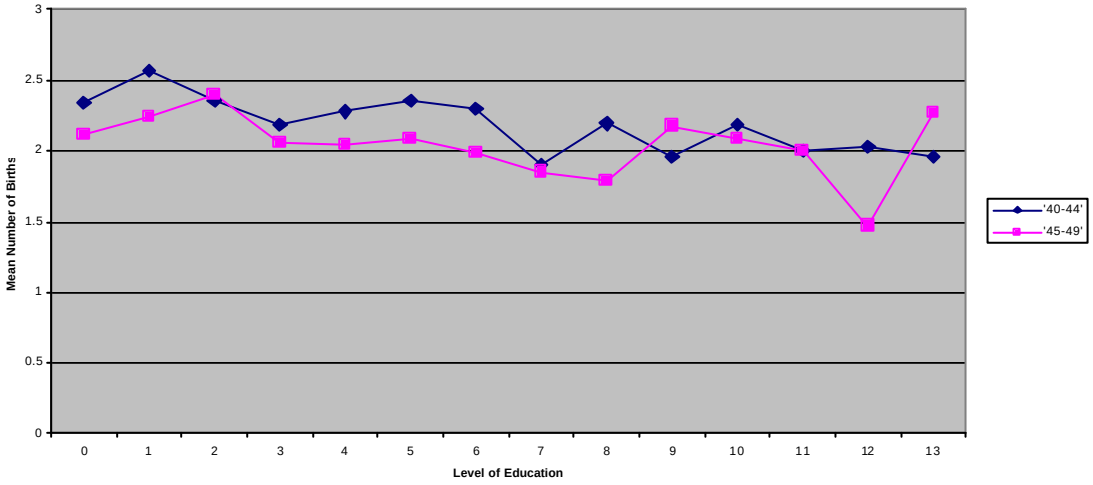
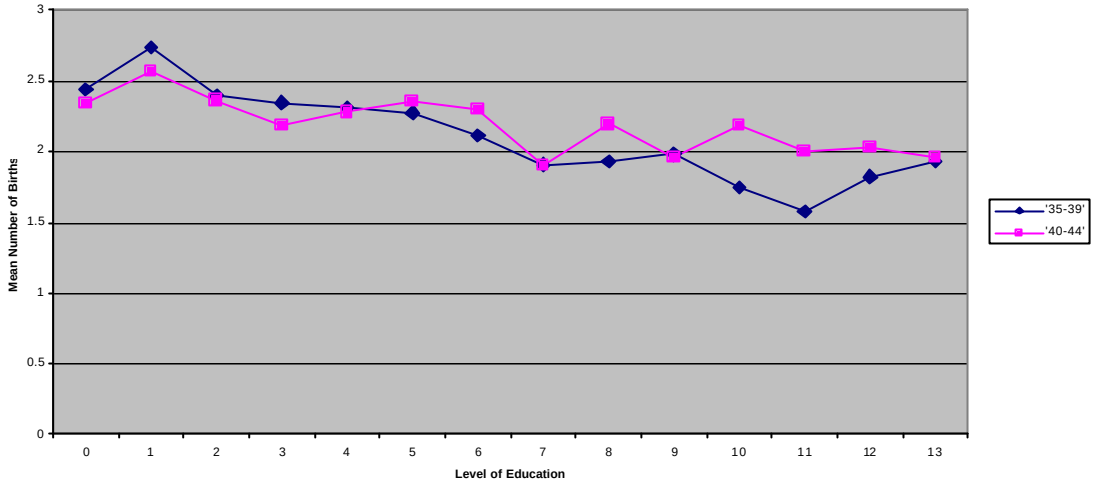


Figure 4b: Mean Number of Births by Age 30 for the 40-44 and 45-49 Age Categories



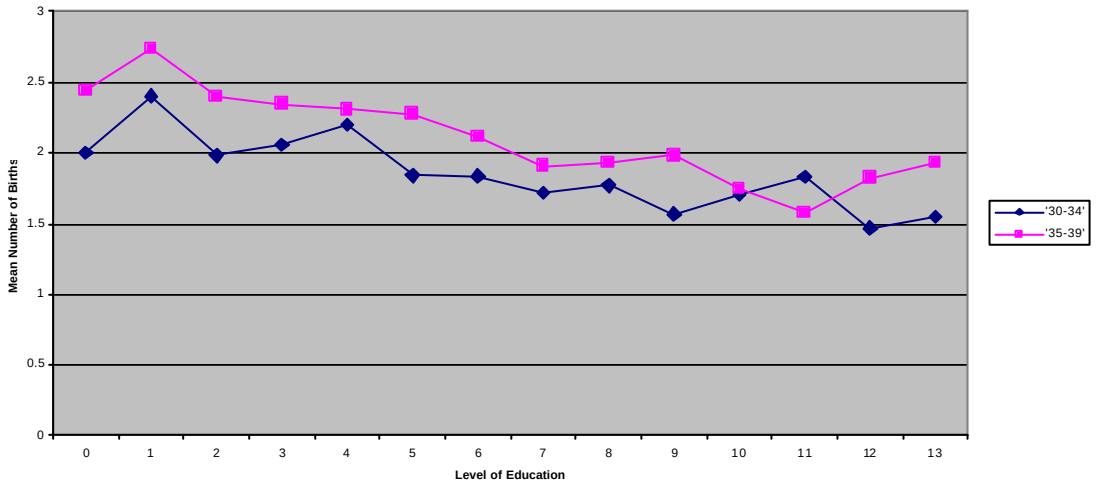
Looking at Figure 4a, no distinct pattern is observable among these age categories. It is notable that fertility is higher for the 45-49 age group at very low levels of education (below standard 3) and also at higher levels (above standard 9). Figure 4b on the other hand shows that the 40-44 age group had a rise in fertility by the age 30 for those women with less than a standard 9 qualification.

Figure 4c: Mean Number of Births by Age 30 for the 35-39 and 40-44 Age Categories



In addition, the data in Table 3 showed that for women in each education level up to standard four, mean number of births continued rising up until the 35-39 age group. However, in the higher education levels, mean number of births rose only as far as the 40-44 age group and then began falling. Figures 4c and 4d reflect this trend as well. This result lends further support firstly to the idea that major gains in educational achievement were observed in women born after 1955 and secondly that these gains had an impact on fertility. Women with higher educational achievement began delaying child bearing prior to reaching thirty years in age.

Figure 4d: Mean Number of Births by Age 30 for the 30-34 and 35-39 Age Categories



3.3 The Distribution of Women Across Various Activities

Having looked at education as well as fertility, we turn our attention to participation and employment in order to gain a feel of how education impacts on these. This is achieved by looking at how women's engagement in the different activities varies with education. Table 5 shows the distribution of African women aged 16 to 54, by their current activity. The numbers

have been weighted to represent actual population figures. We have defined participants as those who are working full-time, working part-time, absent from work, and looking for work. Those falling in the remaining categories have been regarded as non-participants.

It is evident that the majority of these women (25%) are involved in full-time studies whether at school, college or university. These are likely to be women between the ages of 16 and 24. The next biggest group comprises those women seeking work at 24%. Women in full time employment make up 22% of the sample. Therefore three quarters of the women are evenly divided between full time work, no work, and involvement in studies. In addition, there are quite a substantial number (15%) of women involved in housekeeping activities.

Table 5: Distribution of Women by Activity

Description	Number	Percent
Working full time	1647914	22.46
Working part-time	245271	3.34
Absent from work	23974	0.33
Studying	1869778	25.48
Looking for work	1729126	23.56
Not looking for work	552655	7.53
Housekeeping	1096630	14.94
Retired	57355	0.78
Unable to work	113927	1.55
Other reasons	1840	0.03
Total	7338470	100

As already mentioned earlier, it is a general view that education expands women's opportunities in the labour market. We would expect therefore that higher educated women, who desired to work, would be in employment. Furthermore, by virtue of the better quality jobs and higher wages available to better-educated women, these women ought to choose to participate in the labour market rather than alternative activities such as housekeeping. This view ought to hold unless home productivity gains resulting from higher educational attainment outstrip labour market productivity gains. Such an outcome would occur, for example, in instances where greater importance is placed on 'quality of children'.

What follows is an analysis of the distribution of women in different activities by educational attainment. The sample has been restricted to those women aged 30 to 54 in order to provide meaningful analysis at a later stage when education, fertility and employment are brought together. Table 6a illustrates some intriguing results regarding the change in the proportion of women in each activity as educational attainment rises. The data reflects that 22% of women with no formal schooling are in full-time employment. This number increases gradually as level of education increases, culminating in 65% of women with post matric qualification in full-time employment. This result is in accordance with theoretical expectations. Furthermore, the percentage of unemployed women in each education level, excluding post standard 10, ranges from 22% to 27%. Although the variation in these figures is not large, it is noticeable that there is a gradual rise in the percentage of women looking for work as level of education rises.

It is interesting to note that both the percentage of full-time workers and the percentage of unemployed workers rise with educational attainment up to standard 8. A likely cause of this phenomenon is the poor labour absorptive capacity of the South African economy (Bhorat & Hodge 1999). As educational attainment rises, an increasing number of women are pulled into the labour market though not all of them find work. Evidence of this is found by looking at the figures for those women not looking for work and those involved in housekeeping. The data in Table 6a suggest that an increasing number of women move out of non-market activities and into labour market participation as education level rises.

Table 6a: Percentage of Women in Each Activity by Education Level - Aged 30-54

Education level	0	2	4	6	8	10	>10
Working full time	22.05	25.49	26.82	32.23	41.77	52.25	65.34
Working part-time	4.8	6.16	6.17	5.61	5.57	2.93	1.09
Absent from work	0.04	0.69	0.46	0.44	0.24	0.57	1.04
Studying	0.18	0.34	0.57	0.62	1.24	5.51	18.37
Looking for work	21.81	23.56	25.77	26.34	26.99	25.8	10
Not looking for work	10.21	8.74	11.39	8.21	5.61	2.75	0.96
Housekeeping	33.25	27.98	25.23	22.63	16.22	9.64	2.86
Retired	3.61	1.28	1.7	1.47	1.25	0.14	0.17
Unable to work	4.05	5.76	1.9	2.46	1.1	0.4	0.16
Other reasons	0	0	0	0	0	0	0

Up to this stage we have looked at the relationship between education and fertility as well as that between education and activity. It follows then that to round off this section we should combine the three. Table 6b links education, activity, and fertility. It displays the mean number of births of women in each activity, by education level.

The main areas of interest in table 6b are full-time employment, looking for work, not looking for work and housekeeping. These areas contain the bulk of the women who are either participating in the labour market or those who could participate but choose not to. In all these categories a negative relationship between fertility and education is discernible.

Table 6b: Mean Number of Births for Women in Each Activity by Education Level - Aged 30-54

Education level	0	2	4	6	8	10	>10
Working full time	3.18	2.85	2.70	2.53	2.31	2.07	2.07
Working part-time	3.51	3.23	2.86	2.32	2.25	1.91	2.25
Absent from work	8.00	2.42	1.21	2.75	2.38	2.65	2.50
Studying	2.51	1.13	1.37	1.92	1.94	1.65	0.87
Looking for work	2.99	2.78	2.72	2.51	2.07	2.12	1.64
Not looking for work	3.11	3.37	3.28	3.19	2.42	2.25	2.42
Housekeeping	3.80	3.78	3.54	3.19	2.76	2.82	2.59
Retired	3.12	1.80	2.93	2.80	2.08	1.98	3.00
Unable to work	2.19	2.35	2.54	2.39	2.45	0.56	2.00

In comparing the average births between participants and non-participants some inferences could be drawn about the relationship between fertility and employment. The mean number of births for labour market participants is generally lower than that of non-participants. In other words, women in housekeeping have the highest birth figures, followed closely by those classified as not looking for work. The average births for full-time workers and those unemployed are rather similar. This is a reasonable outcome considering that fertility should not influence whether a women is employed or not, once the decision to participate has been made.

However, comparing the average birth figures for the lesser educated participants (standards 0-4) with those of the better educated non participants (standards 8+) it can be seen that even though these women are engaged in full time employment their average births are higher than the better educated non participants. This observation shows that it is not clear cut that participants have lower birth averages than non participants but rather that the outcome is dependent on the strength of the influence of education. One of the goals of the regression analysis that follows is to determine precisely the strength of this influence on fertility and participation.

Despite their relatively high level of education, these women have mean births for those in housekeeping as high as 2.82 for matriculants and 2.59 for post matriculants. It is clear then that these women have chosen not to work and to bear children instead. Thus fertility is of its own accord an influence on the participation decision. Testing the strength of this push factor against the education pull factor is another one of the chief aims of the next section.

4. Empirical modelling

The analysis in this section seeks to determine the relative strengths of the effects of childbearing and education on the labour force activity of African women. It is theoretically plausible that education should have a strong positive influence on labour force participation. This is because education increases work prospects and those who are better educated are likely to engage in labour market activity. Indeed the analysis in the previous section supports this view. It was clearly observed that the percentage of women engaged in the labour force within each education level increased steadily as educational attainment rose. In addition, in accordance with the theory, it is expected that fertility has a negative effect on women's labour force participation. Raising children is a time intensive occupation that demands more time the more young children there are. This section also attempts to address this issue. The main aim of this analysis is to gain a greater understanding of the overall influence of these two opposing forces on participation.

The model we use is one that is adapted from the Brazilian study by Lam and Duryea (1998). It was stated earlier that education impacts on both participation and fertility and that it has an additional indirect effect on participation through fertility. However, we include both education and fertility in the explanatory variables because fertility also has an effect on participation independent of education. Those women who choose not to participate but to devote their time to raising children instead, demonstrate evidence of this point.

Six variables have been chosen as independent variables in our model. The first is 'young ch' which denotes the presence of young children less than six years of age. Throughout this analysis 'young ch' has categories 0-4. The next variable is 'married' and it takes on a value of one if a woman is married and zero otherwise. The third variable is education, labelled 'educat' which is the level of education attained. There are up to 13 levels of education, the thirteenth being a university degree. Level ten denotes a matric qualification which is a prerequisite for tertiary education. The fourth variable is 'rural' which takes on a value of one if a woman resides in a rural area and zero otherwise. The following variable is 'otherinc' which takes on a value of one if there is another source of income in the home of the woman concerned. Age together with 'agesq' which is age squared are the last variables of the model. The relevance of the age quadratic will be discussed at a later stage.

We begin with multinomial regression analysis involving a dependent variable 'wact' with three categories: unemployed = 0, employed = 1, and not-participating = 2. This kind of analysis allows comparison of the influence of the independent variables if an individual is in one category as opposed to the comparison group. A convenient way to display otherwise complex results of the multinomial logit model is to use odds ratios. The odds of outcome versus outcome *n* given x, indicated by $\Omega_{m|n}(x)$ equal: $\Omega_{m|n}(x_i) = \exp(x_i[\beta_m-\beta_n])$. Taking logs shows that the multinomial logit model is linear in the logit: $\ln \Omega_{m|n}(x_i) = x_i(\beta_m-\beta_n)$, (Long 1997:154).

Table 7 displays the results of a multinomial logit regression. Each category of the dependent variable has a 0 or 1 outcome. Looking at the results for category 2, the figures suggest that the odds favouring not participating over being employed (the comparison group) increase by 12 % with each additional child under the age of six that an African women has. Furthermore, marriage has a strong positive influence on the decision not to participate, with the odds favouring not participating increasing by 87% if a woman is married. Each additional level of education attained

decreases the odds of not participating by 12%. Being in a rural area more than doubles the odds of opting out of the labour market. Age on the other hand seems to initially decrease the odds of participation up to a certain age, after which the odds increase with age. This is evident from the opposite sign of the age quadratic.

Table 7: Survey Multinomial Logistic Regression of Participation, Unemployment and Employment

pweight: rnwt
Strata: <one>
PSU: distrea

Number of obs = 11362
Number of strata = 1
Number of PSUs = 2066
Population size = 3563379
F(14, 2052) = 84.79
Prob > F = 0.0000

Activity	RRR	Std. Err.	t	P>|t|	[95% Conf.	Interval]
0:Unemployed						
young ch	1.221844	.0485291	5.045	0.000	1.130285	1.320819
married	1.007891	.0623675	0.127	0.899	.8927111	1.137932
educat	.8861739	.0081882	-13.078	0.000	.8702606	.9023783
rural	1.198498	.0846502	2.564	0.010	1.043474	1.376554
otherinc	.4678631	.030781	-11.545	0.000	.4112301	.5322954
age	.8262438	.0418162	-3.771	0.000	.7481757	.9124579
agesq	1.001685	.0006193	2.724	0.007	1.000472	1.002901
2: Not-participating						
young ch	1.117799	.0432716	2.877	0.004	1.03608	1.205964
married	1.87027	.1134796	10.319	0.000	1.660454	2.106598
educat	.8759358	.0078267	-14.825	0.000	.8607204	.8914202
rural	2.396579	.1621348	12.920	0.000	2.098804	2.736601
otherinc	.5771384	.0351778	-9.018	0.000	.5121144	.6504186
age	.6914176	.0313596	-8.136	0.000	.6325737	.7557353
agesq	1.004512	.0005471	8.265	0.000	1.003439	1.005585

(Outcome 1 (Employed) is the comparison group)

Turning to category 0 (unemployed), a striking feature of the results is that the effect of education on the odds of being unemployed over employed is similar to its effect on the odds of not participating over being employed. Furthermore, the results suggest that the presence of each additional child under six years of age increases the odds favouring being unemployed over employed by 22%. This result raises an interesting question as to whether the presence of young children should influence the employment process or the participation process or both. In a demand-constrained environment such as South Africa's it would seem that the number of children a woman has should not influence whether or not she is employed once she has made the decision to participate in the labour market. The exception would be if numbers of children offers the employer some information that changes the employability of women. We do not address this possibility here.

Although the above methodology provides estimates that are easy to analyse and understand as well as allowing for convenient comparison between the three categories of the dependent variable, it nevertheless is not accurate given our standpoint. Two processes are incorporated in the dependent variable. One is the decision whether to participate or not and the other is whether one is employed or not. It is thus not good practice to combine these in one variable especially when dealing with South Africa which has high involuntary unemployment rates. To overcome this problem the analysis will be carried out with a selection model at a later stage. More will be said about this procedure then. First we analyse the participation decision on its own.

Table 8 displays the results of a logistic regression on participation. In this instance, the dependent variable, participation, takes on the value of one for participants and zero for non-participants. The categories 'employed' and 'unemployed' of the above multinomial logit regression have been collapsed into one category: 'participants'. The same independent variables as in the previous analysis have been included. The results indicate that the presence of young children does not have a significant influence on the participation of African women in the labour market even at the 10% level of significance. This is a very interesting outcome because it is contrary to theoretical expectations and the descriptive analysis carried out in the previous chapter. It would normally be expected that the presence of young children has a significantly negative effect on participation.

The results show that each additional child decreases the odds of participation by a mere 1% and additionally that this effect is insignificant. Part of the reason for this effect might be that there is interaction between this variable and the 'married' variable. However when the regression is run for white women, the fertility variable is significant, suggesting that the results we observe for African women are not due solely to the interaction between these variables. We therefore viewed it more prudent to include both 'young ch' and 'married' in the regression equation.

Table 8: Logit Regression of Participation

8.a African Women Logit Estimates

Number of obs = 11362
Wald chi2(7) = 704.62
Prob > chi2 = 0.0000
Log likelihood = -6679.8504 Pseudo R2 = 0.0869

(standard errors adjusted for clustering on distrea)

part	Odds Ratio	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
young ch	.9883148	.0319687	-0.363	0.716	.927602	1.053001
married	.5367216	.0286135	-11.672	0.000	.4834706	.5958378
educat	1.085894	.008434	10.610	0.000	1.069489	1.102551
rural	.447037	.0282447	-12.743	0.000	.3949689	.5059691
otherinc	1.256045	.0665241	4.304	0.000	1.1322	1.393438
age	1.317977	.0511729	7.111	0.000	1.221401	1.422189
agesq	.9963634	.0004654	-7.800	0.000	.9954517	.997276

8.b White Women Logit Estimates

Number of obs = 2551
Wald chi2(7) = 166.45
Prob > chi2 = 0.0000
Log likelihood = -1530.1441 Pseudo R2 = 0.0906

(standard errors adjusted for clustering on distrea)

part	Robust s Ratio	td. Err.	z	P>|z|	[95% Conf.	Interval]
smlch	.8205886	0914851	-1.774	.076	.6595192	1.020995
married	.2709155	0421611	8.392	0.000	.1996944	.365377
educ_c	1.299436	0552429	.161	.000	1.19555	.412349
rural	.6017053	.1158512	-2.638	0.008	.4125676	.8775514
ohhinc	.467641	.1553878	3.624	0.000	1.192609	1.806099
age	1.178563	.120143	1.612	0.107	.9651198	1.439212
agesq	.9975048	.001209	-2.061	0.039	.995138	.9998773

Besides, it is plausible that fertility has little effect on the participation of African women. When one considers that the majority of these women are poor, it is not difficult to understand that they would work regardless of the presence of young children. On the whole African women do not have adequate financial support that would enable them to spend significant periods of time out of work. Moreover, children may actually serve as a reason to work. Indeed, the regression run for White women reveals that the odds of participation decrease by 18% with each additional child and that this result is significant at the 10% level of significance. Even when 'married' is left out of the regression for African women, on the other hand, their odds of participation shift to a decrease of only 7% with every young child present. It is our contention that the relative affluence of White women affords them the opportunity to stay at home and look after children.

Moving on to the next explanatory variable of interest in our regression, it is found that the odds favouring participating in the labour market increases by 9% with every unit increase in level of education. This result concurs with that displayed in Table 6a in the previous chapter where steady gains in the numbers of women participating were observed with each unit rise in education level. Thus as far as participation goes, the expected trade off between fertility and education has not been observed among African women. Although education has a strong positive influence on participation, the influence of fertility is insignificant.

Furthermore, marriage has a significantly negative effect on participation. The odds favouring participating over not participating when married decrease by 46%. This is an interesting result considering that Africans are relatively poorer than other racial groups in the society and yet the tendency for one spouse to remain at home when the other participates is still prevalent. This result stayed much the same whether rural or urban women were considered. The presence of other income earners in the home has a positive effect on participation. The odds favouring participation when someone else in the home is employed rise by 26%. It would normally be expected that having other sources of income in the home would lower the odds favouring participation seeing that some income is being earned. However, there is a view that members of a household who are employed hear about vacancies and inform relatives at home about work opportunities (Wittenberg 1999). In addition, when other members of the household work, they make available finances for the unemployed to search for employment (Kingdon & Knight 2000). The presence of other household income could therefore be seen more as a proxy for information about the labour market as well as a source of finance for searching for employment, rather than a negative influence on the decision to work.

To incorporate employment in our analysis we need a model that takes cognisance of the fact that analysing the employed exclusively could result in selectivity bias (Heckman 1993). For women to be classified as either employed or not they have to be participants. Running a regression for the employed would only amount to disregarding non-participants, a significant part of our sample, and would thus lead to inaccurate results. The Heckman Selection model for maximum-likelihood probit estimation overcomes this problem. It is a simultaneous equation model that has an employment probit equation and a selection equation. In our case, employment is the dependent variable of the probit equation and participation is the dependent variable in the selection equation. However, the binary outcome, employed or not, is only observed if participation equals one. In addition, three of the six independent variables used in this study have been identified as influencing only participation and not employment. These three variables are the presence of young children 'young ch', marital status 'married', and rural or urban location 'rural'.

Table 9 reflects the results of the probit model. The coefficients of all the explanatory variables associated with employment are significant with the exception of the age quadratic variable which is barely significant at the 10% level of significance. This result implies that there is no significant change in the pattern or direction of influence of age on employment as age increases.

In addition, the coefficients of the variables associated with participation are also significant with the exception of the variable 'young ch', which is insignificant even at the 10% level of significance. This finding is in agreement with that found in the participation logit earlier even though it is now part of a simultaneous model. Furthermore, the age quadratic is highly significant and of the opposite sign to the straightforward age variable in the selection equation. This result implies that there is an interesting hyperbolic relationship between age and participation. This phenomenon will be discussed later when the influence of age on participation is analysed in more detail.

Furthermore, the reported Wald test statistic (321.21) of all coefficients in the regression model (except the constant) being zero is significant, meaning that the null hypothesis can be rejected. The Wald test reported at the bottom of the output tests the comparison of the joint likelihood of an independent probit model for the selection equation and a regression model on the observed employment data against the Heckman model (Greene 1990). This test for rho yields a z = -2.502 and chi squared of 6.26, both significantly different from zero at the 5% level of significance, clearly justifying the use of the Heckman selection equation.

Table 9: Maximum-likelihood Probit Estimation of Employment, Controlling for Participation

Number of obs = 11362
Censored obs = 3959
Uncensored obs = 7403

Wald chi2(4) = 321.21
Log likelihood = -3537031 Prob > chi2 = 0.0000

(standard errors adjusted for clustering on distrea)

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
emply						
educat	.0627189	.0077513	8.091	0.000	.0475267	.0779112
otherinc	.4471379	.0399671	11.188	0.000	.3688038	.525472
age	.092559	.0337538	2.742	0.006	.0264028	.1587152
agesq	-.0006925	.0004141	-1.673	0.094	-.0015041	.000119
_cons	-2.672849	.7207811	-3.708	0.000	-4.085554	-1.260144
part						
young ch	-.0218683	.0211742	-1.033	0.302	-.063369	.0196323
married	-.3695728	.0321413	-11.498	0.000	-.4325685	-.306577
educat	.0492451	.0047272	10.417	0.000	.0399801	.0585102
rural	-.4885463	.037057	-13.184	0.000	-.5611767	-.4159159
otherinc	.1395218	.0317508	4.394	0.000	.0772913	.2017523
age	.1685612	.0234539	7.187	0.000	.1225924	.21453
agesq	-.0022285	.0002821	-7.899	0.000	-.0027815	-.0016756
_cons	-2.442341	.4813171	-5.074	0.000	-3.385705	-1.498977
/athrho	-.350681	.1401554	-2.502	0.012	-.6253805	-.0759815
rho	-.3369794	.12424			-.5548631	-.0758357

Wald test of indep. eqns. (rho = 0): chi2(1) = 6.26 Prob > chi2 = 0.0123

The results are not readily interpretable in their original non-linear form. Therefore predicted probabilities have been calculated to aid interpretation. They indicate the predicted probability

that an event will occur holding all other variables at their means or specified values. For example, the predicted probability of being:

a non-participant is given by: $P(y_j^{probit}=0, y_j^{select}=0)$

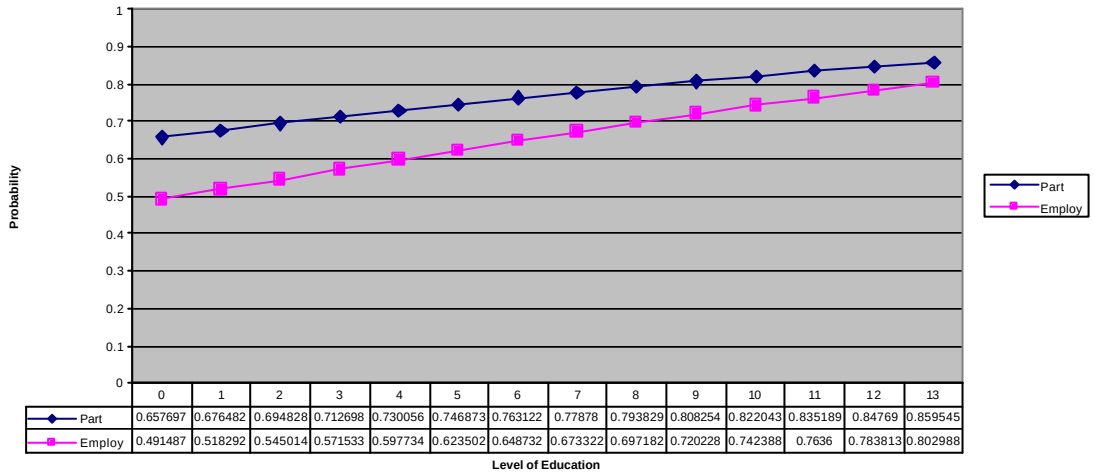
an unemployed participant is given by: $P(y_j^{probit}=0, y_j^{select}=1)$

an employed participant is given by : $P(y_j^{probit}=1, y_j^{select}=1)$.

Henceforth reference to probabilities should be taken to mean predicted probabilities.

Seeing that education and fertility are key elements of our analysis, this is where we begin. To trace out the impact of education, Figure 5 displays two sets of predicted probabilities by level of education. The one is a set of predicted probabilities of participating in the labour market and the other set of predicted probabilities of not only participating but being employed as well at each level of educational attainment. It is evident that the predicted probability of participating rises as educational level rises. It can also be seen that the probability of employment rises as educational attainment rises. The two graphs are fairly linear, therefore, no complex relationship between education and participation or education and employment exists. However, it is noticeable that the gap between the two graphs narrows markedly as education level increases. This reflects greater chances of employment at the highest levels of education.

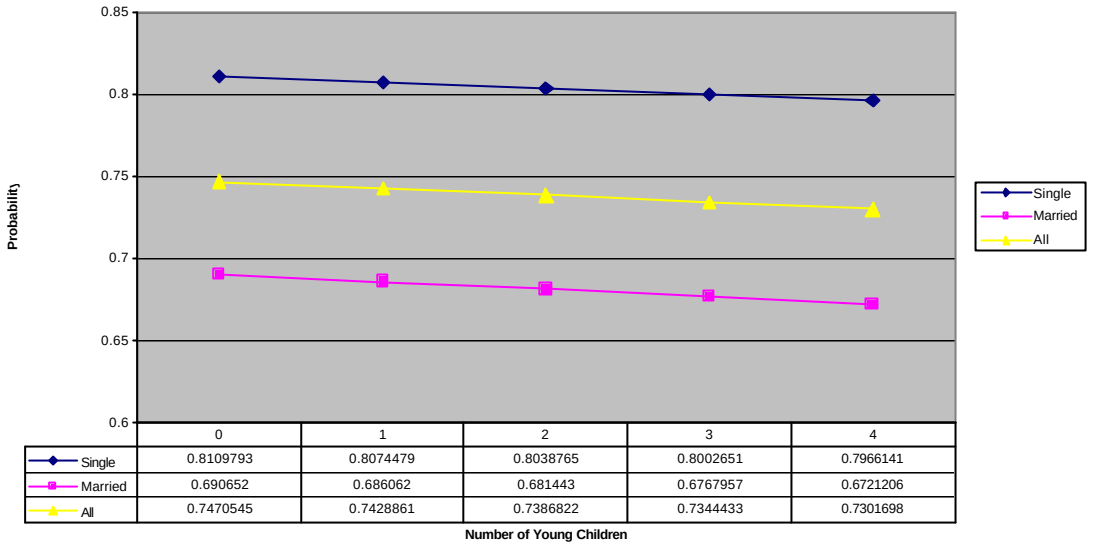
Figure 5: Predicted Probability of Participation and Employment by Education Level



	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Part	0.657697	0.676482	0.694828	0.712698	0.730056	0.746873	0.763122	0.77878	0.793829	0.808254	0.822043	0.835189	0.84769	0.859545
Employ	0.491487	0.518292	0.545014	0.571533	0.597734	0.623502	0.648732	0.673322	0.697182	0.720228	0.742388	0.7636	0.783813	0.802988

Incorporating fertility into the analysis, Figure 6 graphs the predicted probability of participating in the labour force given the education level and number of young children a woman living in an urban area has. The graph has been further divided by marital status in an attempt to further investigate the earlier identified interplay between fertility and marriage.

Figure 6: Predicted Probability of Participation by Young Children and Marital Status



	0	1	2	3	4
Single	0.8109793	0.8074479	0.8038765	0.8002651	0.7966141
Married	0.690652	0.686062	0.681443	0.6767957	0.6721206
All	0.7470545	0.7428861	0.7386822	0.7344433	0.7301698

It is clear from Figure 6 that there is a negative relationship between number of young children and the predicted probability of participating in the labour market. The relative strength of this relationship is similar for both married and single women. However, it can be seen that single women have the highest probability of participating whereas married women show the least predicted probability of participating. It may seem rather surprising that there is no convergence between the probabilities for married and single women as number of children increases, however, this is perfectly consistent with the findings reported in our regression output of a significant married effect.

The preceding analysis has focused on the influence of fertility and education on the probabilities of participation and employment. Attention is now shifted to the other explanatory variables in our model, in particular the three binary variables. Table 9 provides a useful display of the probabilities associated with each variable. Each variable takes on the value of one if an event occurs and zero if not. Discussion of the output is restricted to those results that are thought to be particularly interesting. Looking at marriage first, the probability of participating in the labour force is 14% higher for women who are single than it is for those who are married, holding all other variables constant. This result is hardly surprising given that of the two categories, married women are more likely to be housewives.

Table 10: Predicted Probabilities of Being in a Given Work Status

	Married		Rural		Other income	
	0	1	0	1	0	1
Participating	0.739	0.602	0.745	0.601	0.637	0.689
Employed	0.615	0.624	0.635	0.604	0.508	0.702

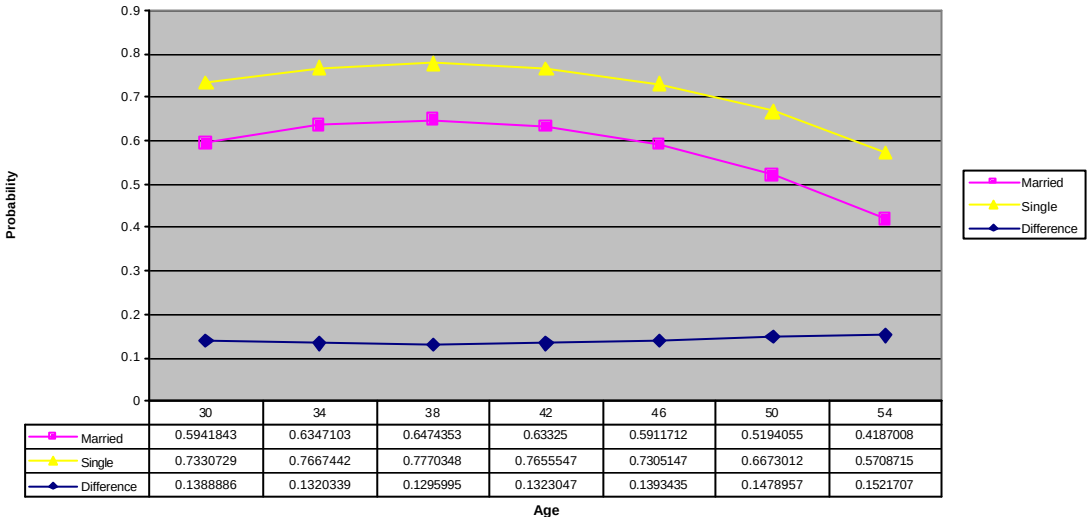
Table 10 also shows that the predicted probability of participating in the labour force is 15% higher for women in urban areas than it is for those in rural areas. In addition, the chances of employment are 4% lower in rural areas.

With respect to having other household income, Table 10 shows that having other household income increases the chances of participating in the labour force by 5%. In addition, the probability of employment increases by 19% if there is other household income. At first glance this may seem an unlikely result, however, throughout this analysis the data has suggested that

other household income serves as a proxy for information about work opportunities as well as a means to finance searching for employment. Therefore, women who live with people who are employed stand a greater chance of employment.

Figure 2 in the previous section showed most vividly the significant improvements in education that accompanied movements from older to younger age categories. For example, 15% of women aged 50-54 had attained more than primary schooling and this figure improved to 49% for women aged 30-34. Figure 4 in turn showed how the effect of education on fertility varied with age. Therefore looking at the changes in probability of participation and employment by age category and then controlling for the binary variables, for example the 'marriage' variable, is another useful way to capture the nature of these effects on labour market decisions.

Figure 7: Predicted Probability of Participation by Age and Marital Status

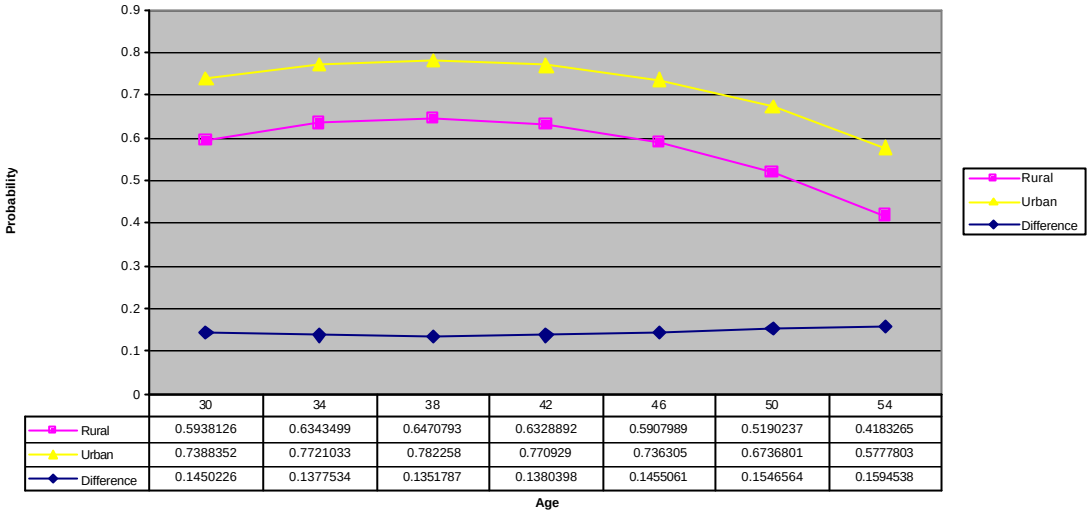


	30	34	38	42	46	50	54
Married	0.5941843	0.6347103	0.6474353	0.63325	0.5911712	0.5194055	0.4187008
Single	0.7330729	0.7667442	0.7770348	0.7655547	0.7305147	0.6673012	0.5708715
Difference	0.1388886	0.1320339	0.1295995	0.1323047	0.1393435	0.1478957	0.1521707

Figure 7 plots the probability of participation by age for married and single women as well as the difference between the two. It is clear from the graph that the probability of participation is lowest for married women and highest for single women in all age categories. The predicted probabilities of participation display a slight upward trend initially (up to 38 years of age) followed by a downward trend with age for all three classifications. This provides graphical illustration of the selection equation result with respect to the age quadratic.

Furthermore, the graph shows that the highest probability of participation is found in the 38 year old women. For single women this value is 78% and it falls to 57% for the 54 year old women. In addition, being married as opposed to single lowers the predicted probability of participation by 13% for women who are 38 years old. This gap widens as age increases meaning that the impact of marriage on participation is more pronounced for older women.

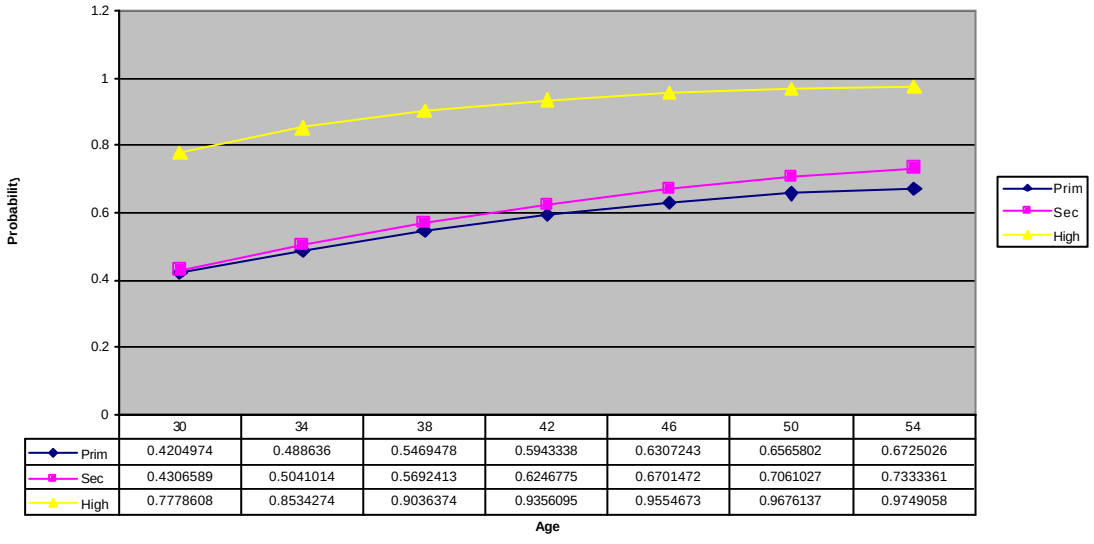
Figure 8: Predicted Probability of Participation by Age and Location



	30	34	38	42	46	50	54
Rural	0.5938126	0.6343499	0.6470793	0.6328892	0.5907989	0.5190237	0.4183265
Urban	0.7388352	0.7721033	0.782258	0.770929	0.736305	0.6736801	0.5777803
Difference	0.1450226	0.1377534	0.1351787	0.1380398	0.1455061	0.1546564	0.1594538

In contrast to Figure 7, Figure 8 plots the predicted probabilities of participation given rural or urban location rather than marital status. A similar pattern to that observed in Figure 7 is apparent. Urban women have a higher chance of participating in the labour market than rural women. This difference in predicted probability of participation starts off at 14.5% for 30 year old women and falls to 13.5% for 38 year old women, before rising again to peak at 15,9% for 54 year old women. It can generally be said then that location plays a larger role in women's participation status, the older they are.

Figure 9: Predicted Probability of Employment by Age and Education

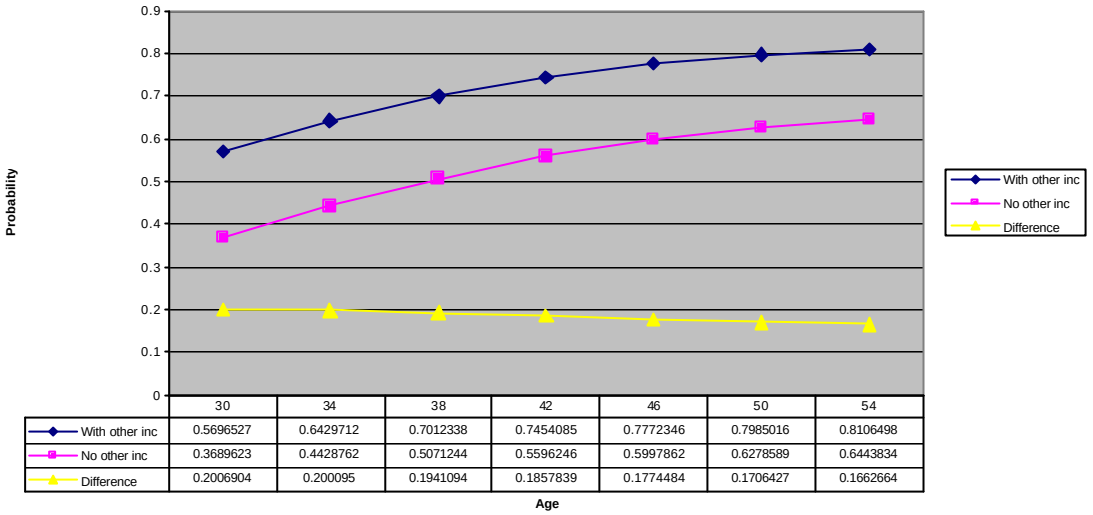


	30	34	38	42	46	50	54
Prim	0.4204974	0.488636	0.5469478	0.5943338	0.6307243	0.6565802	0.6725026
Sec	0.4306589	0.5041014	0.5692413	0.6246775	0.6701472	0.7061027	0.7333361
High	0.7778608	0.8534274	0.9036374	0.9356095	0.9554673	0.9676137	0.9749058

Moving on to employment, Figure 9 graphs the predicted probabilities of being employed as age changes for women within the three education levels. As can be expected, the chances of employment are lowest for those women with least schooling. Women with incomplete secondary education have a slight edge over those with primary education. The advantage enjoyed by these women increases slightly as age increases whereas it is hardly noticeable at the lower age groups. One feature of this graph that stands out is that women with completed

secondary schooling (matric) and higher qualifications (diplomas and degrees) have predicted probabilities of employment that are a great deal above the rest.

Figure 10: Predicted Probability of Employment by Age and Other Household Income



	30	34	38	42	46	50	54
With other inc	0.5696527	0.6429712	0.7012338	0.7454085	0.7772346	0.7985016	0.8106498
No other inc	0.3689623	0.4428762	0.5071244	0.5596246	0.5997862	0.6278589	0.6443834
Difference	0.2006904	0.200095	0.1941094	0.1857839	0.1774484	0.1706427	0.1662664

In all the regressions run thus far, the results reflect that having other household income has a significant effect on the likelihood of employment. Indeed, Figure 10 confirms this finding. The graph shows that women who have other household income have a far greater predicted probability of employment than those without these additional funds. For a woman who is 30 years of age, having other household income gives her a 20% greater chance of employment than a woman of the same age without other household income. However, having other household income plays a slightly lesser role as age increases. As can be seen from Figure 10, the difference is 16.6% for women who are 54 years old as opposed to 20% for those women who are 30 years old.

5. Conclusion

This paper reveals how improvements in the education of African women evolved as well as how fertility patterns changed in response to these improvements. In addition, this study was not limited to participation only, but extended to employment as well. With respect to education and employment it was discovered that there is little difference in the likelihood of employment between women with primary schooling and incomplete secondary schooling. Women with higher qualifications, on the other hand, were found to enjoy a substantially greater chance of employment

An intriguing outcome of our modelling was that the number of young children an African woman has does not significantly affect the participation decision. The interplay between the 'young children' and 'marriage' variables may have in part accounted for the insignificant result but this does not detract from the fact that with or without the marriage variable included in the regression, the effect of young children on the odds of participation is rather small. It is thought that financial constraints compel African women to seek work. Thus having more children necessitates more income and therefore a greater desire to work. The influence of education was found to be significant as was expected.

With regard to marriage, however, it was interesting to find that there is a strong tendency for a woman to be a non-participant when married. In addition, the presence of other income earners in the household seemed to encourage participation and improve the predicted probability of

employment. It is thought that employed household members provide those that are unemployed with both information about work opportunities as well as resources with which to search for employment, hence the positive relationship to participation. Although there is a hyperbolic relationship between age and predicted probability of participation, it has been discovered that the predicted probability of participation generally decreases with age, whereas the predicted probability of employment rises continually with age.

Bibliography

Barker, F. (1995). The South African Labour Market: Critical issues for Reconstruction. Pretoria: J.L. van Schaik Publishers.

Becker, G. (1965). The Theory of the Allocation of Time. Economic Journal, Vol. 79, pp. 502-5.

Becker, G. (1991). A Treatise on the Family. Cambridge: Harvard University Press.

Bhorat, H & Hodge, J. (1999). Decomposing Shifts in Labour Demand in South Africa. South African Journal of Economics, Vol. 67(2).

Bhorat, H & Leibbrandt, M. (2001). Modelling Vulnerability and Low Earnings in the South African Labour Market. Chapter 4 in Bhorat, H,, Leibbrandt, M., Maziya, M., van der Berg, S. and Woolard, I. Fighting Poverty: Labour Markets and Inequality in South Africa. Cape Town: UCT Press.

Blau, F., Ferber, M. and Wonkler, A. (1998). The Economics of Women, Men, and Work. New Jersey: Prentice-Hall, Inc.

Blundell, R. et al. (1994). The Measurement of Household Welfare. Cambridge: Cambridge University Press.

Deaton, A. (1997). The Analysis of Household Surveys, A Microeconometric Approach to Development Policy. Baltimore: John Hopkins University Press.

Dilnot, A. & Duncan, A. (1992). Thinking About Labour Supply. Journal of Economic Psychology, Vol. 13, pp. 687-713.

Dinkelman, T and Pirouz, F. (2000). Individual, household and regional determinants of labour force attachment in South Africa : Evidence from the 1997 October Household Survey. Paper presented at the TIPS Annual Forum, Muldersdrift, Glenburn Lodge.

Fallon, P. & Lucas, R. (1998). South African Labour Markets: Adjustment and Inequalities. Discussion Paper, No. 12: Informal Discussion Papers on Aspects of the Economy of South Africa, World Bank Southern African Department, Washington.

Fisher, M. (1971). The Economic Analysis of Labour. London: Weidenfeld & Nicolson.

Flanagan, R. et al. (1984). Labour Economics and Labour Relations. U.S.A: Scott, Foresman & Company.

Gould, W & Sribney, W. (1999). Maximum Likelihood Estimation with STATA. Texas: STATA Corporation.

Greene, W. H. (1990). Econometric Analysis. New York: Macmillan Publishing.

Gujarati, D. (1992). Essentials of Econometrics. New York: McGraw-Hill, Inc.

Hamilton, L. (1992). Regression with Graphics: A Second Course in Applied Statistics. California: Duxbury Press.

Hamilton, L. (1998). Statistics with Stata 5. Pacific Grove: Duxbury Press.

Heckman, J. (1983). Sample Selection Bias as a Specification Error. Econometrica, Vol. 47, pp. 153-61.

Hofmeyr, J. F. (1998). Segmentation in the South African Labour Market. Working Paper, No. 15: South African Network for Economic Research, Potchefstroom.

International Labour Office. (1996). Restructuring the Labour Market: The South African Challenge. Geneva: International Labour Office.

Kerr, C. & Staudohar, D. (1986). Economics of Labour in Industrial Society. California: Jossey-Bass, Inc.

Killingsworth, M. R. (1983). Labour Supply. Cambridge: Cambridge University Press.

King, J. (1980). Readings in Labour Economics. New York: Oxford University Press.

Kingdon, G. & Knight, J. (2000). Are Searching and Non-searching Unemployment Distinct States when Unemployment is High? The Case of South Africa. Working Paper: Centre for the Study of African Economies, University of Oxford.

Lam, D. & Duryea, S. (1998). Effects of Schooling on Fertility, Labour Supply, and Investments in Children, with Evidence from Brazil. The Journal of Human Resources, Vol. 34, No. 1, pp. 160-92.

Lam, D. & Schoeni, R. (1993). Effects of Family Background on Earnings and Returns to Schooling: Evidence from Brazil. Journal of Political Economy, Vol. 101, No.4, pp. 710-40.

Lam, D. & Schoeni, R. (1994). Family Ties and Labour Markets in the United Sates and Brazil. The Journal of Human Resources, Vol. 29, No. 4, pp. 1235-58.

Lazaro, N., Molto, M. & Sanchez, R. (1997). Women's Labour Force Participation and Part Time Work in Spain. Labour, Vol. 11, pp. 449-68.

Long, J. S. (1997). Regression Models for Categorical and Limited Dependent Variables. California: Sage Publications

Maglad, N. A. (1998). Female Labour Supply in Sudan. Special Paper, No. 30 African Economic Research Consortium, Nairobi.

Mason, K. (1986). The Status of Women: Conceptual and Methodological Issues in Demographic Studies. Sociological Forum, Vol. 1, pp. 284-300.

Moll, P. (1998). Discrimination is Declining but Inequality is not. Working Paper, No5. South African Network for Economic Research, Potchefstroom.

Mroz, T. (1987). The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumptions. Econometrica, Vol. 55, No. 4, pp765-769.

Mwabu, G & Schultz, T. (1996a). Wage Premia for Education and Location by Gender and Race in South Africa.Unpublished Paper. Yale University, New Haven.

Sapsford, D & Tzannatos, Z. (1993). The Economics of the Labour Market. London: MacMillan Press Ltd

Schultz, T. (1993). Returns to Women's Education, Women's Education in Developing Countries: Barriers, Benefits, and Policies. Baltimore: John Hopkins University Press

STATA Corporation. (1999). Stata User's Guide; Release 6. Texas: Stata Press

STATA Corporation. (1999). Stata Reference Manual; Release 6. Texas: Stata Press

Strauss, J & Thomas, D. (1995). Human Resources: Empirical Modelling of Household and Family Decisions. Handbook of Development Economics, Vol. 2, North Holland Press.

Winter, C. (1997). Women Workers in South Africa: Participation, Pay and Prejudice in the Formal Labour Market. Washington: The World Bank, Draft Paper.

Wittenberg, M. (1999). Job Search and Household Structure in an Era of Mass Unemployment: A Semi-Parametric Analysis of the South African Labour Market, Working Paper, No. 22: South African Network for Economic Research, Potchefstroom.