Women Wage Earning and Education in Rural Nigeria

Omowumi A. Olowa[1], Adetola I Adeoti[2], Kemisola O. Adenegan[2] and Omobowale A. Oni[2]

[1]. Department of Agricultural Education, Federal College of Education (Technical) Akoka, Lagos, Nigeria.
[2]. Department of Agricultural Economics, University of Ibadan, Ibadan. Nigeria
Olowa2@yahoo.com

Abstract: Determining how women's education affects their wage earnings is remarkably important in today's society where women are increasingly entering the labor market. Human Capital Theory suggests that women who acquire more education earn more than women who have less education. Using a sample of 48067 women from Harmonised National Living Standard Survey 2010 data collected by Nigeria Bureau of Statistics in 2009/2010, an Heckman model was used to examine the effect of education on women wage earning. It was revealed that the higher the level of education, the higher the wage accruing to individual women in rural Nigeria. The study suggested that women should be encouraged to attend school and when it is necessary try to convince them to obtain higher degree of education.

[Omowumi A. Olowa, Adetola I Adeoti, Kemisola O. Adenegan and Omobowale A. Oni. **Women Wage Earning and Education in Rural Nigeria.** *World Rural Observ* 2014;6(1):26-30]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). http://www.sciencepub.net/rural. 5

Keywords: Wage earning, Rural Nigeria, Agricultural wage, Non- Agricultural wage, Education.

Introduction

In rural areas of developing countries, involvement of women in labour activities is becoming more important. Rural women respond to new economic opportunities by adjusting their labor allocation, considering returns to education, which may differ from activity to activity. This paper is an empirical attempt to quantify this difference. That is, the effects of education on women wage earning in both agriculture and non–agricultural sectors in rural Nigeria.

The emergence of human capital theory in the late 1950s drew attention to the investment aspects of education, both at the private and the social level. The treatment of educational investment as investment in human capital rests on the assumption that the additional education acquired by individuals will lead to an increase in their productivity, which will be rewarded with higher wage earnings. Education is thought to raise productivity through the provision of skills and knowledge, which increase the efficiency and hence the value of the more educated.

The effect of education on wage earning has been investigated extensively. Evidence abounds in every-day life and literature for the fact that the acquisition of education improves the present and future earnings of individuals (Angrist and Krueger, 1991; Aromolaran, 2004 and Okuwa, 2004). The issue, then, is whether this holds among women in the rural area of Nigeria where it is said that about half of the populace are women. This paper therefore examines the effect of education on women wage earning and provides more updated results, which may have important policy implications.

The rest of the paper is structured as follows. Section II provides the material and methods.

Section III explains the theoretical framework and model specification. Section IV contains the results of estimated models. The last Section summarises the findings and also concludes.

Material and Methods

The data used in this study was drawn from a cross-sectional data obtained from the field survey conducted in by Nigeria Bureau of Statistics (NBS) in 2009/2010. The survey contains detailed information on education and earnings as well as a wide range of other data on the labour market activities and other social and economic characteristics of 70374 women 15 years of age and older. After deleting observations with missing data, a total of 48067 women were left and that formed the sample of this study.

Theoretical Framework and Model Specification

The wage of women workers both in classical and neoclassical economic theory, can be expressed as a function of education, work experience, number of children and other shifters to account for dynamics and time trend.

Following Olorunfemi and Olowofeso (2007) the Heckman model was used to analyse the effect of education on female earning. The model represents the classic way for dealing with selection on unobservable variables. The selection on unobservable occurs when the error term in the outcome equation is correlated with the treatment, or with the selection into the sample being used for estimation. The sample selectivity is an acute problem in cross section when studying the labour participation.

The difference between workers and non-workers determines the sample selection bias because some components of the work decision are relevant to the wage determining the process and the unobservable characteristics that affect the work decision and the wage.

The usual setup is as follows. The wage equation is written as:

$W = \beta \cdot X_i \varepsilon_i$ ----------1

where W is the hourly wage and is observed only for working women, X are observed variables related to productivity and "i is the error term that includes all unobserved determinants of wages; it does not matter whether X is observed for just workers or for everyone, as this information will only be used for workers.

The Heckman model requires the following assumptions:

(a) $(\varepsilon,\mu) \sim N(0, 0, \sigma_\varepsilon^2, \sigma_\mu^2, \rho_{\varepsilon\mu})$;

(b) (ε,μ),

(c) Var $\mu = \sigma_\mu^2 = 1$

The first assumption represents a very strong functional form assumption-namely joint normality of the distribution of the error terms in the participation and outcome equations. The second equation assumes that both error terms are independent of both sets of observable variables. The final assumption is the standard normalization for the probit selection equation, which is identified only up to scale. Now if we take the expectations of the wage equation conditional on working we have

$E(W_i/\varpi_i, Xi) = E(W_i/Z_i, X_i, \mu_i) = \_X_i + E(W_i/Z_i, Xi, \mu_i) = \beta X_i + E(\varepsilon_i/Z_i, Xi, \mu_i)$ ----------2

The first equality just recognizes the fact that the variables determining employment in this model are Z and μ. The second equality comes from the fact that the expected value of X given X is just X. The final term can be simplified by noting that selection into employment does not depend on X, only on Z and μ, so we have:

$E(Wi|\varpi_i, Xi) = \beta X_i + E(\varepsilon_i|\varpi_i = 1) = \beta X_i + E(\varepsilon_i|\mu i > -Zi\gamma)$ ----------3

Thus, if we estimate the model using only data about workers, we do not get the population wage equation, but rather something else. As a result of this term, the OLS estimation on a sample of workers generally provides inconsistent estimates of the parameters of the population wage (or outcome) equation.

In the first stage, a probit regression is computed in order to estimate the probability that a given female actually work. The estimate of γ from this probit model is then used to construct consistent estimates of the inverse Mills ratio term:

$$\lambda(Z_i\gamma) = \frac{\phi Z_i \gamma}{\varphi(Z_i\gamma)}$$ ----------4

where $\phi(.)$ and $\varphi(.)$, denote the probability density and cumulative distribution functions of the standard normal distribution. In the second stage, the outcome equation is estimated by OLS, where the equation wage includes both the original X and the constructed value of inverse Mills ratio.

$W = \beta' X_i + \varepsilon_i + V\lambda_i$ ----------5

With the inverse Mills ratio included, and under the assumptions noted above, the coefficients on the X represent consistent estimates of the parameters of the population wage equation. The coefficient on the inverse Mills ratio term estimates $\rho\sigma_\varepsilon$. Since $\sigma_\varepsilon > 0$ by definition, the sign of this coefficient is the same as the sign of ρ (.). The sign of ρ (.) is often substantively useful information, as it indicates the correlation between the unobservable in the selection and outcome equations.

Result and Discussion

Educational Status and Income

Table 1 shows that in the high income category, majority of the women had no formal education (16.7) while 2.1%, 6.3% and 2.6% are for women with Primary, Secondary and Tertiary educational status. This indicates that though majority of the self-employed women are in the high income level, a higher percentage of wage employed women are in the high income category.

Table 1: Distribution of Women by Educational Status and Earning

Educational Status	High Income	Low Income	Total
No Formal Education	8015 (16.7)	22867 (47.6)	30882 (64.2)
Primary	1016 (2.1)	2799 (5.8)	3815 (7.9)
Secondary	3047 (6.3)	8949 (18.6)	11996 (25.0)
Tertiary	1236 (2.6)	137 (0.3)	1373 (2.9)
Total	13314 (27.7)	34753 (72.3)	48067 (100)

Source: Result of Data Analyzed 2012. Figures in parentheses are percentages

Effect of Education on Women Earnings

Only the sub-sample of women engaged in labour market activities is used for this analysis. A total of 48067 women fall into this category, and this sample forms the basis of the analysis. Three different models (OLS, IV and Heckman) models were estimated by regressing the natural logarithm of the monthly wage rate (LnY), on education, experience, experience square and no of children. The analysis

was done for all working women, women in wage employment (agricultural and non- agricultural) and those in self-employment separately.

Table 2 presents the coefficients of the education and experience variables for all women from the earnings equations estimated with the three estimators. The wage equation was estimated with three different models, OLS, IV and Heckman models. When estimating the wage equation for women different problems are faced: selection bias, heterogeneity and eventually endogeneity. There is selection bias because the dependent variable of the wage equation can be measured only if the individual participates in the labour market. The literature offers estimators for correcting this problem (Heckman 1979, Olorunfemi and Olowofeso (2007).

Heterogeneity is associated with the unobserved ability and motivation of an individual (e.g. education), and if this unobserved individual effects are correlated with the regressor of the model, the simple estimations with OLS are inconsistent.

The analysis was carried out on a sample that is limited to women from ages 15 to 65. Both participants and non-participants women were used to estimate the selection equation, while to estimate the wage equation we only use women that participate in the labour market.

First OLS estimate estimation was done with an assumption that there isn't sample selection, then the IV and Heckman Models to correct the sample selection and where all regressors are considerate exogenous. The result reveals that the't' statistics test on the sample selection coefficient (lambda) in the Heckman's 2-step indicates the presence of sample selection bias the values are 1.342 (5.326) significant at 1%. In other words, the use of the censored sample model (OLS) would lead to incorrect estimates for the valuation of wage equation for women in rural Nigeria. Therefore the result of the Heckman model is reported.

Table 2 presents the coefficients of the education dummies and experience variables for all women from the earnings equation estimated. The model for wage employment explains about 37% of the variations in log earnings while that of self-employment explains about 45%. For wage employment, the result reveals a positive relationship between Primary (0.004), Secondary (0.105), Tertiary (0.243) educational levels, years of experience (0.181) and earnings of women in rural Nigeria. This implies a slight change in primary, secondary and tertiary educational levels will lead to 0.4 percent, 10 percent and 24 percent change in wage earning respectively. While a change (an increase) in years of experience will lead to an 18 percent increase in wage earnings. Similarly, in self-employment activities, Primary (0.331), Secondary (0.274), Tertiary (-0.803) educational levels and years of experience (0.162) were significantly related to women earnings with tertiary education showing a negative relationship. While a change in primary, secondary and years of experience will lead to about 33 percent, 27 percent and 16 percent increase in earnings of women engaged in self-employment in rural Nigeria, increase in Tertiary education will lead to about 80 percent decrease in it. The low (negative) returns to tertiary education may explain the negative effect of tertiary education on entry into the self-employment, while the relatively higher returns to primary and secondary education may explain the positive effect of primary and secondary education on entry into self-employment. Surprisingly, number of children (0.075) has positive relationship with women's earnings in self-employment activity. The result indicates that an increase in the number of children increases their earnings by 7.5 percent. This might not be unconnected with the fact that some grown up children in the household are involved in market activities. The result agrees with the previous study of (Okuwa 2004, Olorunfemi and Olowofeso 2007; Malathy, 1989).

Effect of Education on Non- Agricultural Wage

Table 3 shows the result of the analysis of the effects of education on Non-Agricultural Wage using the subset of the women who are employees in the non-agricultural sector. The dependent variable is the natural log of average monthly wage from non-agricultural employment. As the table shows, different levels of education have significant positive effects on the wage level for women in non-agricultural wage employment. The wage of women is expected to increase by 13% with primary education, 28% with secondary education and 49% with tertiary education. (Model A). These parameters imply the following Mincerian rates of returns (dividing coefficient by the standard years of schooling): 1.4% for education up to the primary level, 3.1% for education up to the middle level, and 4.4% for education up to the secondary and higher level. This range is consistent with the estimates in earlier studies on the returns to schooling in non-agricultural wage (Fafchamps and Quisumbing, 1999; Alderman et al., 1996). When the schooling year (i.e., standard years of basic education, 9 years in Nigeria) and its quadratic term were included as education variables (Model B), only the positive coefficient on the quadratic term was statistically significant. These results suggest that return to education increases with education at an increasing rate, which is consistent with the findings of Cohen and House (1994).

Table 2: The Effect of Education on Women Earnings

Variables	Wage employment	Self- Employment
Pry.	0.004 (1.802)*	0.330 (2.188)**
Sec.	0.105 (2.059)**	0.274*** (4.153)
Ter.	0.243*** (5.180)	-0.803*** (3.138)
Exp.	0.181 (9.015)***	0.162* (1.719)
Exp^2	-0.001 (0.003)	-0.002 (0.006)
No of Children	0.044 (0.976)	0.0749 (1.726)*
Con.	7.102 (10.181)***	8.830 (14.189)***
R^2	0.37	0.45
$AdjR^2$	20.5	49.43
Lambda	1.342*** (5.326)	3.455*** (3.002)

Source: Result of Data Analyzed 2012. t-statistics are in parenthesis (***, **,*) = coefficients significant at 1% (5%, 10%) level.

Table 3: The effect of education on Non-Agricultural Wage

Variables	Using Educational Level (Model A)		Using years of schooling (Model B)	
	Coefficient	t-statistics	Coefficient	t-statistics
Pry.	0.125**	2.381		
Sec.	0.276***	3.813		
Ter.	0.485***	6.556		
Exp.	0.674**	2.034	0.154***	4.258
Exp^2	-0.002**	-2.801	-0.283*	1.835
Yrsch			0.104	0.043
$yrsch^2$			0.153*	0.069
No of Children	-0.050	-0.7083	-0.011	0.024
Con.	4.138***	(4.3260)	3.220**	1.960
R^2	0.214		0.220	
$AdjR^2$	0.253		0.211	
Lambda	2.309**	2.212	0.433*	1.680

Source: Result of Data Analyzed 2012. (***, **,*) = coefficients significant at 1% (5%, 10%) level.

Regarding the experience variable, a 1% change in work experience (0.674 and 0.154) for women in the sampled area is accompany with the positive return of 67% when educational levels was used and 15% when years of education was used. The square of the experience is negative and significant for the models, which means that the relation between the experience and the wage is the same after a high number of years of experience. This result is in line with previous work by (Mroz 1987, Okuwa 2004, Olorunfemi and Olowofeso 2007 and Nicodemo 2007, Schultz, 1980; Malathy, 1989).

Effects of Education on Agricultural Wage

To determine the effects of education on agricultural wage, the subset of the women who work in the agricultural sector as employees were used and the result presented in Table 4. The dependent variable is the natural log of average monthly wages from agricultural employment. In sharp contrast to results in the non-agricultural sector, only the coe□cient of primary education(0.173) dummy is significant suggesting that primary education will increase the wage of hired labour by 17% equivalent to about 1.9% Mincerian returns (Mode A). Education higher than the primary level does not seem to contribute to higher agricultural earnings. When both linear and quadratic terms of schooling years are included (Model B), both are significant while the linear is positive with a coefficient of 0.156, the quadratic is negative with a coefficient of -0.506,implying that a marginal returns to education becomes negative at more than nine years of schooling. Experience has significant and positive effect on the agricultural sector earnings; it is greater when educational level was used (16%) than when years of schooling was used (2%). The coefficient on the square of experience is negative and significant, which indicates decreasing experience effect. The non-response of agricultural wages to higher education is understandable considering the nature of the casual farm labour market in rural Nigeria. Most of these farm workers are hired for unskilled, manual work on the farm such as weeding, harvesting, transporting, etc. It is no wonder that job experiences

or education do not contribute much to increment in the wage earn in such works.

Table 4: The effect of education on Agricultural Wage

Variables	Using Educational Level (Model A)		Using years of schooling (Model B)	
	Coefficient	t-statistics	Coefficient	t-statistics
Pry.	0.173***	3.555		
Sec.	0.321	0.233		
Ter.	0.192	1.46		
Exp.	0.167**	2.534	0.018*	1.750
Exp^2	-0.002**	-2.120	-0.020	-0.013
Yrsch			0.156**	2.600
$yrsch^2$			-0.506*	-1.690
No of Children	-0.049	0.084	0.022	1.234
Con.	4.038***	11.325	5.040***	11.132
R^2	0.330		0.230	
$AdjR^2$.	0.256		0.220	
Lambda	0.013**	2.125	0.051**	1.880

Source: Result of Data Analyzed 2012. (***,**,*) = coefficients significant at 1% (5%, 10%) level.

Conclusions

This paper investigated the effects of education on women wage earning using a cross-sectional data obtained from the field survey conducted by Nigeria Bureau of Statistics (NBS) in 2009/2010. The education effects are estimated both for agricultural wages and non- agricultural wages. It is clear that the higher the level of education, the higher the wage accruing to individual women in non- agricultural wage employment sector. Thus, Government, Non-governmental Organisation (NGO) and individual should encourage women to attend school and when it is necessary try to convince them to obtain higher degree of education. This is important as education can increase the knowledge and skill of women and also improves their awareness of the importance of independence which will propel them to picking up paid employment.

Correspondence to:
Department of Agricultural Education, Federal College of Education (Technical) Akoka, Lagos, Nigeria. P. O. box 269, Yaba, Lagos, Nigeria
Olowa2@yahoo.com

References

1. Alderman, H., J.R. Behrman, D. R. Ross, and R. Sabot (1996) "The Returns to Endogenous Human Capital in Pakistan's Rural Wage Labour Market," *Oxford Bulletin of Economics and Statistics*, 58(1): 29-55.
2. Angrist, J.D., and Krueger, A.B., 1991. Does compulsory school attendance affect schooling and earnings? Quarterly Journal of Economics 106(4), 979-10.
3. Aromolaran, Adebayo B., 2004. Female schooling, non-market productivity, and labour market participation in Nigeria Economic Growth Center Discussion Paper No 879, Yale University, January 2004.
4. Cohen, B. and. House, W. J. 1994. "Education, experience and earnings in the labour market of a developing economy: The case of urban Khartoum". World Development, 22(10):549–65.
5. Fafchamps, M., and Quisumbing, A. R.1999. Human Capital, Productivity, and Labour Allocation in Rural Pakistan, The Journal of Human Resources, 34(2), 369-406.
6. Heckman, J. J., 1979. Sample selection bias as a specification error. *Econometrica 47* (1), 153– 162.
7. Okuwa, O.B., 2004. "Private Returns to Higher Education in Nigeria," *Research Paper*, No. 139, African Economic Research Consortium (AERC), Nairobi, Kenya.
8. Olorunfemi S. and Olowofeso O. E., 2007, Sample Selection Analysis of Wage Equation for Women in Ondo State Nigeria. *Journal of Social Sciences* 3 (3): 127-133.
9. Malathy, R. 1994. Education and Women's Time Allocation to Non-market Work in an Urban Setting in India; *Economic Development and Cultural Change* 42, 743-760
10. Mroz, T. A. (1987). "The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumptions," *Econometrica*, Vol 55, No. 4, July, 765-799.

1/2/2014

539