

*Full Length Research Paper*

# **The effects of educational attainment on poverty reduction in Cameroon**

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**In recent years education has been promulgated as a primary weapon against poverty. Hence it is important to investigate the impact of different levels of education upon poverty. The objective of this study is to evaluate the effect of different levels of education of the employed individuals as determinants of poverty in Cameroon. The data for this study come from the 2001 Cameroonian Household Survey obtainable from the National Institute of Statistics. A sample-selectivity corrected logistic regression model is estimated based on the cross-sectional data, with the probability of an individual being poor as the dependent variable and a set of educational levels and experience as explanatory variables. The results depict that improvement in experience and educational attainments reduce the probability of being poor of the employed individual. On the gender side the study concludes that a male's educational level is more poverty reducing than a female counterpart.**

**Key words:** Education, poverty reduction, gender, Cameroon.

## **INTRODUCTION**

It has been established that investment in education and human capital formation are essential for economic growth and poverty reduction. The inter-relationship between education and poverty can be understood in two ways. Firstly, investment in education increases the skills and productivity of poor households. It enhances the wage level as well as the overall welfare of the population. Secondly, poverty may constitute a major constraint to educational attainment. This may be interpreted from three perspectives. The very first one is from the resource-side where poverty may handicap the acquisition of learning and other pedagogic materials (see Awan et al. 2008). The second perspective is that poverty may generate social pressures which mutilate the mindset of poor students and lastly, Bramley and Karley (2005) have shown that when poverty grabs an institution it deteriorates the teaching standards.

It is documented in the literature that education and poverty are inversely related. The higher the level of education of the population the lesser will be the number of poor individuals because education impacts knowledge

and skills which is supportive in higher wages (Tilak, 1994). Having established the inverse relationship between education and poverty, there is still a debate relating to the educational levels whether primary education is enough for poverty reduction or all educational levels (primary, secondary, higher and tertiary) have to be considered. Even the Millennium Development Goals (MDGs) of the United Nations and the Poverty Reduction Strategy Papers (PRSP) recommended by the World Bank focus upon primary education and the education of the girl child as a gateway out of poverty. In developing countries the social returns of primary education are much higher as compared to that of tertiary education (Colclough, 2005). Perhaps, this may justify the provision of primary education at large scale in most developing countries by attributing a high proportion of public funds towards it. King (2005) has argued that the agenda of the Millennium Development Goals or Universal Primary Education cannot be achieved by only universalizing primary education. Therefore the provision of primary education without giving right consideration to secondary

and higher education will constrain development through absence of up-to-date curriculum, lack of skills in administrative posts and in management. The Cameroonian educational system is rather unique in Africa in that it is composed of the Anglophone and the Francophone sub-systems which reflects colonial heritage from Britain and France. Efforts have been underway since 2006 to harmonize these two systems, notably at the basic level where primary education is today six years for both sub-systems. The education policy in Cameroon is implemented by three ministries: namely the Ministry of Basic Education, the Ministry of Secondary Education, the Ministry of Higher Education. From independence, the educational sector has often received the lion's share of the national budget which has ordinarily been used to finance all the operating costs in public schools and 80 percent of the same costs in non public schools (Boyle, 1996). This shows the high priority accorded to education by the Cameroonian government. Compared to the rest of sub-Saharan Africa, the Cameroonian education system has performed well. The adult (those aged 15 and above) literacy rate in 2001 was estimated at 72% in Cameroon compared to 62% in sub-Saharan Africa (UNDP, 2003). However, there exists important regional and gender disparities in educational attainment in the country. In 2001, the net school enrolment rate of those aged 6 - 14 years was 79% nation wide, 90% in urban areas, and 70% in rural areas (INS, 2001). These educational attainments were however, threatened by the economic downturn which hit the country following the decline in commodity prices at the world market. As a result the government reduced her expenditure on social services including that on education. For example, Public expenditure on education fell from \$309 million to \$223 million from 1995 through 1999. Similarly, the student-teacher ratio in primary schools increased from 51 - 65 between 1997 and 2000 (UNDP, 2003).

Although a variety of studies have shown that investment in human resources yields important benefits (Tafah, 1998; Psacharopoulos, 2002) this does not mean that investment in human capital should be undertaken indiscriminately. As resources are limited, it is important to know which form of investment in education yields the highest gain and hence is most pro-poor. The purpose of this study therefore is to evaluate the impact of different levels of schooling on poverty so as to detect the most poverty-reducing education level in Cameroon. More specifically we would estimate the impacts by gender. This will reveal whether there are disparities in returns in educating females and males at different educational levels in the Cameroonian labour market. Now, if the labour market rewards male child schooling more than female or if it discriminates between the two genders, parents may have an incentive to invest more in boy child education. Estimating the returns to educational levels by gender and hence on poverty reduction has received little

attention in the Cameroonian context.

The paper is organized as follows: Section 2 reviews the existing literature. Section 3 outlines the methodology and describes the data. Section 4 presents the results while Section 5 concludes the study.

## LITERATURE REVIEW

A number of studies have analyzed the way human capital accumulation confers benefits to individuals, enterprises and societies (see Becker, 1975; Psacharopoulos 1994, 2002; Blundell et al. 1999; Barro, 2001). Some of the benefits take the form of higher earnings, productivity or economic growth. In addition, investment in human capital has also been related to a wide range of non-economic benefits arising from better-educated people and higher knowledge in society. Education and health endowments of individuals are important components of human capital which make them productive and raise their standard of living or reduce poverty. Human capital is required for the effective utilization of physical and natural capitals. Being a developing country Cameroon has designed its poverty reduction strategy paper, which is one of the main pillars to fight poverty in the country. Without human capital formulation the goal of development or poverty reduction is futile.

The prominent approaches of development like the human capital approach, the basic needs approach, the human development approach and the capability approach recognize the inverse relation of education and human poverty. Apart from concentrating on the inverse relation of education and poverty, a mutually reinforcing relation is present between education poverty (lack of education) and income poverty because income deprivation restricts individuals from attaining education and absence of education cause low-income levels (Tilak, 2002; Roberts, 2003).

One notable thing regarding the role of educational attainment in poverty reduction is the direct linear relationship between education and earnings. Education does not only increase the probability of being employed. Once in employment, better-educated individuals earn considerably more than the less-educated. From an economic point of view this is an unsurprising result and has been substantiated by numerous studies. Tafah (1998) studying private returns to education in Cameroon reached the conclusion that returns to education are positive and in some cases higher than returns to investment in other sectors of the economy. Primary education gives the highest returns followed by secondary and tertiary education. Thus, he concludes that investment in primary education should be emphasized and that individuals willing to pursue further education should be made to bear a higher proportion of the cost of such education. We could trace the following additional studies

which estimate rates of return for Cameroon. The first one by Lanot and Muller (1997) use data from a sample of women in Yaounde and is therefore not representative of the population. In a second study, Bigsten et al. (2000) 170 companies in the manufacturing sector. Ewoudou and Vencatachellum (2006) have also analyzed private returns to education in the Cameroon context. More recent studies include Ndjoko et al. (2009) who use a structural Tobit model and Nguetse, (2009) who employs a propensity score matching method to estimate the returns to schooling in the Cameroonian informal sector. In Kenya, Manda and Bigsten (1998) have analysed the impact of educational expansion and returns to schooling. They found that private return to secondary and tertiary education is high, while it is close to zero for primary education.

Although many studies find evidence of a strong positive relationship between educational attainment and labour market outcomes, some authors have argued that such effects are overestimated as they do not include unobserved factors, such as individuals' innate ability, family background or other social factors. Ashenfelter and Krueger (1994) in a study of identical twins showed that the effects of controlling for ability, race, social class and family background could lower estimated returns to education by about 25%. However, in another study, Ashenfelter and Rouse (1998) showed that error in the measurement of human capital (for instance, omission of the quality of education) acquired may lead to an underestimation of rates of return by as much as 30 per cent. These two studies suggest that the measurement error and the omission of control variables in the estimations of returns to education may tend to bias the estimates.

Educational levels (primary, secondary, higher and tertiary) are valuable in increasing the per capita expenditure of the household. As expenditures include the non-food items hence again education is relevant from the overall welfare point of view. Further, educational levels are significant elements in reducing the chances of the household to be poor (Okojie, 2002). It would be misleading to say that growth, development and poverty reduction hinge on the universalizing of primary education. Primary education is the initial threshold of human capital but secondary and higher education, and investment in science and technology will give rise to acceleration and sustenance in economic growth development, and hence poverty reduction. Some authors have reached the conclusion that the likelihood of being poor is higher for the lower level of education (Rodríguez and Smith, 1994; Coulombe and McKay, 1996). Again, Dollar and Kraay, (2002) have concluded that growth is a prominent factor in eliminating poverty and that the impact of primary education attainment is not so much important.

There exist a number of indirect channels through

which better education can affect societies. The main idea is that education produces external effects that impact on others than the ones directly benefiting from it. One of these external benefits is social cohesion, which fosters political stability, and creates safer opportunities for investment in physical capital (Sianesi and Van Reenen, 2002). At the macro-level, this would have a positive impact on national income and lead to higher economic growth and possible reductions in the poverty level. At the microeconomic level a few concrete facts have been established empirically. Among the best documented are the positive effects of education on health for educated individuals themselves and their children (Bauman and Rosen, 1982; Desai 1987). Similarly well established is the effect of parents' education on their children's cognitive development (Angrist and Lavy, 1996; Lam and Dureya, 1999).

From this brief review, it becomes apparent that we must know the determinants of poverty for an effective poverty reduction strategy to be designed. Further, education appears as a main weapon for poverty reduction that has to be checked time and again so as to strengthen the argument of educational expansion in an economy. Rather than focusing upon macro level and cross country analyses we undertake a micro level research so as to better evaluate the impact of education upon poverty in Cameroon. This micro-data based approach is very much relevant for a developing country like Cameroon whose main problems are widely prevalent at grass root level. We could not trace any study in the country that attempts to link educational achievement with poverty reduction efforts. Hence, the main contribution of this study is to evaluate the effect of different levels of education upon poverty at individual levels in Cameroon.

## METHODOLOGY AND DATA

### Data description and source

The analyses in this study are based on the second Cameroonian Household Survey conducted in 2001 (referred henceforth as CHS II). The CHS II data set is obtainable from the National Institute of Statistics. In the data-set a range of questions relating to employment, expenditure and earning information are available. The survey also captures information on household as well as individual characteristics such as level of educational attainment, quality of housing, education and health status. The survey actually visited 10992 households made up of 56443 individuals.

The explained variable in this study is derived from the monthly earnings of an individual from his/her main occupation. These earnings include any premium that the individual may have received in addition to his/her regular wage/salary. The explanatory variables include five educational dummies for the different levels of educational attainment (no education, primary, secondary, higher and tertiary education) and experience. The experience variable is obtained through subtracting the years of schooling and school starting age from the age of an individual. It is not the actual but the potential experience of the individual.

**Methodology**

**The logistic regression equation**

To realize the objective of this study we employ a logistic regression. Logistic regression analysis extends the techniques of multiple regression analysis to research situations in which the outcome variable is categorical. The model for logistic regression analysis assumes that the outcome variable, Y, is categorical (e.g., dichotomous) and models the probabilities associated with the values of Y. The dependent variable (Y) is dichotomous and takes the value 1 for the poor individual and 0 for the non-poor individual. In theory, the population proportion of cases for which  $Y = 1$  is defined as  $p = P(Y = 1)$ . Then, the theoretical proportion of cases for which  $Y = 0$  is  $1 - p = P(Y = 0)$ . Our task here is to estimate  $p$  for the sample proportion of cases for which  $Y = 1$ . We achieve this by carrying out a log transformation to normalize the distribution. This log transformation of the  $p$  values to a log distribution enables us to create a link with the normal regression equation. The log distribution (or *logistic transformation of p*) is expressed by the equation (see Dayton, 1992; Hoffmann, 2004):

$$\text{Log}_e \left[ \frac{P(Y = 1 / X_1, \dots, X_n)}{1 - P(Y = 1 / X_1, \dots, X_n)} \right] = \text{Log}_e \left[ \frac{p}{1 - p} \right] \quad (1)$$

$$= \alpha + \beta_1 X_1 + \dots + \beta_n X_n \quad (2)$$

$$= \alpha + \sum_{j=1}^n \beta_j X_j \quad (3)$$

Where:  $p$  is the conditional probability of the form  $P(Y=1/ X_1, \dots, X_n)$ .  
 Log = natural logarithms  
 $e$  = the base of natural logarithms (approx 2.72),  
 $\alpha$  = the constant of the equation  
 $\beta$  = the coefficient of the predictor variables, and  
 $n$  = is the number of predictors or explanatory variables

There are two basic reasons underlying the development of the model above. First, probabilities and odds obey multiplicative, rather than additive, rules. However, taking the logarithm of the odds allows for the simpler, additive model since logarithms convert multiplication into addition. And, second, there is a simple exponential transformation for converting log-odds back to probability. In particular, the inverse transformation is the logistic function of the form:

$$P(Y = 1 / X_1, \dots, X_n) = \frac{e^{\alpha + \sum_{j=1}^n \beta_j X_j}}{1 + e^{\alpha + \sum_{j=1}^n \beta_j X_j}} \quad (4)$$

Basing on the mathematical relationship,  $\frac{e^a}{1 + e^a} = \frac{1}{1 + e^{-a}}$  for  $P(Y=1)$ , the logistic function for linear regression analysis is sometimes presented in the form:

$$P(Y = 1 / X_1, \dots, X_p) = \frac{1}{1 + e^{-\alpha - \sum_{j=1}^p \beta_j X_j}} \quad (5)$$

Due to the mathematical relation,  $\frac{1 - e^a}{1 + e^a} = \frac{1}{1 + e^{-a}}$ , the probability for a 0 response is:

$$P(Y = 0 / X_1, \dots, X_n) = 1 - P(Y = 1 / X_1, \dots, X_n) = \frac{1}{1 + e^{\alpha + \sum_{j=1}^n \beta_j X_j}} \quad (6)$$

**Fitting the logistic regression model to data**

There are two important stages in the analysis of data. First, estimates for the parameters in the model must be obtained and, second, some determination must be made of how well the model actually fits the observed data. The parameters that must be estimated from the available data are the constant,  $\alpha$ , and the logistic regression coefficients,  $\beta_j$ . Because of the nature of the model, estimation is based on the maximum likelihood principle using iterative solution procedures (Dayton, 1992). This iterative solution procedure is available in popular statistical procedures such as STATA version 9.2 which we use to estimate the model in this study.

We investigate the effect of different schooling levels and potential experience upon the probability of being poor of the employed individuals. The dependent variable is the probability of being poor. We obtain this probability by using the poverty line established by the National Institute of Statistics. Based on the calorie-based approach the poverty line in Cameroon has been established at 345535 CFA F per year (INS, 2001). From this, we derive the average monthly threshold which enables us to separate employed individuals into poor and non-poor groups. This is done by assigning the value of one to an individual whose monthly earning is below the poverty threshold and zero otherwise.

**Sample selection bias**

As earnings are observed only for those who are employed, the estimates derived from the logistic regression above may be biased because of sample selection (Heckman, 1979). In order to correct for the sample selection bias problem, the Heckman's two-step estimation procedure would be applied, as suggested by Greene (2003). This entails constructing a binary variable with 1 if individual is employed, and zero otherwise. When the binary variable is 1, another variable expresses the individual's probability of being poor. Concretely, the model can be expressed simultaneously using a waged-work participation equation and a valuation (probability of being poor) equation as follows: First, we define a binary variable,  $Z_i$ , for the waged-work participation equation and  $Y$  for the valuation or probability of being poor equation, conditional on two latent continuous variables  $Z^*$  and  $Y^*$  such that (Fonta and Omoke, 2008):

$$\begin{aligned} Z^* &= x_i' \alpha + \varepsilon_i \\ Z_i &= 0 \text{ if } Z_i^* \leq 0 && \text{Paid-work participation equation} \\ Z_i &= 1 \text{ if } Z_i^* > 0 \end{aligned} \quad (7)$$

**Table 1.** Displays the descriptive statistics of the predictors used in this study. Summary Statistics

Variable	Obs.	Min.	Max.	Mean	St. Dev.
Age	19324	17	99	21.97	17.81
Experience	19324	1	68	23.64	18.7
Household Size	19324	1	38	7.54	4.37
Males	10265	0.00	1	0.47	0.45
Females	9026	0.00	1	0.42	0.39
Single (Celibataire)	11453	0.00	1	0.43	0.47
Married	7871	0.00	1	0.41	0.44
Never attended School	10417	0.00	1	0.21	0.40
Primary Education	21844	0.00	1	0.45	0.49
Secondary Education	10506	0.00	1	0.22	0.41
Higher Education	4323	0.00	1	0.09	0.28
University Education	1741	0.00	1	0.04	0.18

Source: Summarised by Author from CHS II.

$$Y^* = w_i' \beta + \mu_i$$

$$Y_i = Y^* \text{ if } Z_i = 1$$

Valuation equation (8)

$Y_i$  is not observed if  $Z_i = 0$

Where the latent variable  $Y^*$  is the observed individual earning;  $x$  and  $w$  are matrices of demographic and other socio-economic covariates;  $\alpha$  and  $\beta$  are vectors of parameters to be estimated.  $\epsilon_i$  and  $\mu_i$  are two error terms with joint cumulative density functions, and assumed to have a bivariate normal distribution with mean zero and correlation coefficient  $\rho$ . When  $\rho = 0$ , the two equations are independent and the parameters can be estimated separately (Strazzer et al., 2003).

The conditional expected value of  $Y_i$  conditional on  $Z=1$  and on the vector  $w_i$  is expressed as:

$$E [Y_i / Z = 1, w_i] = w_i' \beta + \rho \sigma_j \lambda(x_i' \alpha) \quad (9)$$

Where;  $\lambda(x_i' \alpha) = \frac{\varphi(x_i' \alpha)}{\Phi(x_i' \alpha)}$  are the inverse Mills ratio,

and  $\varphi$  and  $\Phi$  is the standard normal density and standard normal functions respectively.

Equations 7 and 8 would be estimated using the Heckman's two-step approach because of its computational simplicity. The Heckman's procedure (Heckman, 1979) is carried out in two steps. Step 1, a probit regression is computed to obtain a consistent estimator of  $\alpha$  and then the estimated  $\alpha$  is used to estimate the inverse Mills ratio ( $\lambda$ ) for each individual. Step 2, the estimated  $\lambda$  is used as an instrument or regressor in the logit model. The selectivity-corrected logit model includes the explanatory variables; levels of education and experience. In addition, individual and household demographic variables are used as exclusion restrictions which are assumed to determine participation in paid-employment but do not directly affect the probability of being poor.

We recognize that the coefficients on different levels of schooling in the logit function can only be interpreted as the causal effect of education on the probability of being poor if there were no endogeneity problem. But it has been demonstrated in the literature that there is clearly an endogeneity of schooling in the earnings function framework yielding inconsistent estimates of returns to

schooling (Soderbom et al., 2005; Trostel et al., 2002). The instrumental variables methodology, among others, has often been used to resolve the problem. However, instrumental variable estimates are based on selected samples (earnings functions are estimated on subsets of individuals reporting earnings in waged work). Sample selection issues may be further compounded as a small sub-sample of the population reports parental education and/or spouse's education as instruments. Controlling simultaneously for both sample selection effects and endogeneity of schooling in earnings function estimates is often constrained by data availability. This is because such an exercise would require an additional set of instruments that do not directly affect either earnings or participation in paid-work; a condition often very hard to meet given data constraints. In this study we control only for sample selectivity bias because of lack of reasonable instruments in our data set.

## RESULTS

### Descriptive Statistics

In the survey, we have 19324 labour market participants<sup>1</sup>, among who are 10265 males and 9026 females. The mean age of the sample is 21.9, with a standard deviation of 17.8. The average household size is 7.5 and mean potential experience of the sample is 23.6 years. Observe from Table 1 that that a high proportion of the sample has only primary education, about 45% for the entire sample while University education has the lowest rate of attainment, 4% for the entire sample.

### Estimation results

In the methodology section we expressed two types of

<sup>1</sup>Here we mean those who are of working age and are employed or not. Those not employed must have actively looked for waged-employment for at least a month. Students and apprentices are not considered.

**Table 2.** Probability of Participating in Paid-Employment (17-60) by Gender, Dependent Variable: Participation = 1; Non-participation = 0.

Variables	Males	Females
	Coefficient	Coefficient
Constant	-1.53*** (0.04)	-2.28*** (0.03)
Age	0.07** (0.01)	0.06** (0.01)
Age <sup>2</sup>	-0.001** (0.00)	-0.001** (0.00)
Bachelors (Single)	0.12*** (0.08)	0.11** (0.03)
Married	0.25** (0.05)	-0.26*** (0.05)
Urban Area	0.56** (0.06)	0.47*** (0.14)
Rural Area	0.36*** (0.09)	0.08** (0.07)
Pseudo R <sup>2</sup>	0.078	0.082
% correctly predicted	84.3	85.7
(c-statistic)		
Likelihood ratio test	13.3 (p<0.000)	11.7 (p<0.001)
Obs.	10265	9026

Source: Computed by author using STATA 9.2

Note: \*\*\* and \*\* indicate significance at the 1 and 5% levels respectively. Standard errors are presented in parentheses. The analysis is restricted to individuals aged 17 - 60 years.

equations to determine the factors that influence an individual's probability of being poor and correct the selection bias: the participation equation 7 and the valuation equation 8. The Heckman's two step correction technique is used to estimate the equations. Starting with the participation equation to explain included versus excluded individuals, we estimate a probit equation to identify some demographic and socio-economic variables of the sample that would likely influence an individual's decision to participate in paid employment, but are assumed not to influence the magnitude of the probability of an individual being poor. The dependent variable of the waged-participation function is binary: it takes the value of 1 when the individual participates in paid employment and the value of 0 if it does not. Among the identified explanatory variables related to an individual's decision to participate in paid-employment are: age, area of residence, and marital status<sup>2</sup>.

The results of the binary probit estimation are displayed in Table 2.

The signs of the coefficients of the variables in this model all make intuitive sense. The relation between age and paid-employment participation is of hill shaped: at the beginning, an individual's probability of participating in paid-employment increases with age, when age reaches its optimal level the probability begins to fall as age continues to increase. This is especially true in the public

service where the maximum age for salaried/waged-work employment is set at 35 years. Marital status (bachelors) has a positive association with paid-employment participation for both males and females. Being married has a significantly positive association with male paid-employment participation, while it has a significantly negative association for females. This difference in gender association is reflective of economic responsibility: for males, marriage increases financial responsibility while for females the reverse is true in the Cameroonian society. As concerns the area of residence, there are some interesting disparities across genders. Although both males and females are significantly more likely to be waged-workers in urban areas than in rural, the probability seems to be larger for men and smaller for women suggesting that the types of employment opportunities available to men and women differ between urban and rural areas.

Table 2 includes statistics that can be used to assess our logistic regression results. The c-statistic has values well above 84 percent indicating that the resultant probabilities are correctly predicted. The likelihood ratio tests for the model indicate that the logistic regression model provided a good fit to the data. The small values of the R<sup>2</sup> pose no problem to the validity of the model. These are pseudo-R<sup>2</sup> and have no straight forward interpretation. It does not mean what R<sup>2</sup> means in OLS regression. In linear regression, R<sup>2</sup> has a clear definition: it is the proportion of the variation in the dependent variable that is explained by predictors in the model. Attempts have been devised to yield an equivalent of this concept for the logistic model. None, however, renders the meaning of variance explained nor corresponds to predictive efficiency (Menard, 2000). For these reasons, we can treat the pseudo R<sup>2</sup> values as supplementary to the more useful likelihood ratio tests, and we suggest interpreting this statistic with great caution.

Next, we estimate the valuation function. The dependent variable in this equation is the probability of being poor. In addition to the explanatory variables discussed so far, we introduce the inverse Mills ratio which comes from the probit estimation equation so as to correct for sample selection bias. The results of the estimation are displayed in Table 3.

Observe in Table 3 that for both male and female regressions, experience and all educational levels are negatively related with the poverty status of the employed individual. On the experience-side, we observe that as an individual gains experience the likelihood of being poor declines. This proves true for both genders although at different rates. Some striking findings emerge as concerns levels of schooling. Firstly, the coefficients on education levels are negative and progressively declining from no level through university level for both genders, indicating that the probability of being poor is decreasing for the employed at these levels of education. This is

<sup>2</sup> Some individual and household characteristics such as household size, distance to school, possession of electricity; etc. that were not significant are not reported

**Table 3.** Logit regression results adjusted for sample selectivity bias, dependent variable: probability of being poor (poor = 1; non-poor = 0).

Variables	Males	Females
	Coefficient	Coefficient
Constant	6.91***(0.08)	4.31***(0.46)
Experience	-0.001***(0.00)	-0.001***(0.00)
Experience <sup>2</sup>	-0.06***(0.00)	-0.07*** (0.001)
Never attended School	-0.84**(0.17)	-0.95**(0.14)
Primary Education	-0.73***(0.03)	-0.78***(0.10)
Secondary Education	-0.69***(0.11)	-0.70**(0.02)
Higher Education	-0.31**(0.02)	-0.39***(0.05)
University Education	-0.15**(0.02)	-0.16**(0.06)
Mills Lamda ( $\lambda$ )	-0.41***(0.05)	-0.47**(0.12)
P-value	0.000	0.000
Wald-chi <sup>2</sup>	5144.57	1901.26
Obs.	10265	9026

Source: Computed by author using STATA 9.2

Note: \*\*\*and \*\* indicate significance at the 1% and 5% levels respectively. Standard errors are presented in parentheses. The analysis is restricted to individuals aged 17 - 60 years.

equivalent to the convex relationship between education and earnings and hence poverty reduction that some studies have established in the literature (Kingdon and Unni, 2001; Söderbom et al., 2005). It means that higher levels of education reduce the probability of being poor. In other words, the higher the level of educational attainment, the more poverty reducing is its impact. Secondly, on the gender side, our result is in favour of the widely prevalent concept of gender bias. This is because the coefficients at all education-levels are significantly lower (in absolute terms) for males than for females. This signifies that the earnings of males at each level of education are more poverty reducing than for their female counterparts. Finally, an important theoretical explanatory variable observed in Table 3, is the mills lambda ( $\lambda$ ) variable, which explains the correlation between the paid-employment participation decision equation and the valuation equation. Since the coefficients on  $\lambda$  are negative and statistically significant for all genders, it implies that if we had excluded individuals with no waged-payment from the estimation, the final estimates of the results would have suffered from a downward-bias problem.

### Conclusion and policy implication

The main objective of this study is to estimate the effect of education upon poverty-reduction in Cameroon. The data used for this task are taken from the second Came-

ronian Household Survey conducted in 2001 by National Institute of Statistics. The results of the logistic regression are in accordance with the generally accepted theory that educational attainment is a critical determinant of the incidence of poverty and should be considered primarily in implementing poverty reduction programmes. The results have shown that education attainment has a negative impact upon poverty. The other notable thing is the consistent increase in the chances of escaping poverty of an individual as we increase the educational level. It means that as educational achievement increases, the likelihood of an individual to be poor declines. Therefore education is the most important factor regarding poverty reduction. The attainment of education enhances the earning potential of individuals and consequently, the increased earnings will definitely help them to be out of poverty. Education is negatively linked with the poverty status and higher levels of education will be more and more effective in poverty reduction. Experience has also a negative relation with the poverty status because obviously as the experience grows a person's expertise in a particular field enhances which provides him/her an opportunity to earn higher. It can be taken as an improvement in expertise and skill enhancement, which have positive implications in case of poverty elimination. Gender-wise, women face more constraints in pulling themselves out of poverty as compared to men due to their unequal educational and employment opportunities. The study concludes that a male reduces more the risk of poverty as compared to the female. Therefore, there is a need to take action so as to provide a conducive employment environment for the female with equal educational opportunities. Women are more than half the population of the Cameroon society and improvements in their welfare will definitely have wide-reaching poverty-reducing effects.

### REFERENCE

- Angrist JD, Lavy L (1996). "The Effect of Teen Childbearing and Single Parenthood on Childhood Disabilities and Progress in School". NBER Working Paper, 5807.
- Ashenfelter O, Krueger A (1994). "Estimates of the Economic Return to Schooling from a New Sample of Twins". Am. Econ. Rev. pp.84-85.
- Ashenfelter O, Rouse C (1998). "Income, schooling, and ability: Evidence from a new sample of identical twins". Quarterly J. Economics, 113-1.
- Awan SM, Malik N, and Sarwar H (2008). "Impact of Education on Poverty reduction" EABRT and TLC Conference Proceedings, Rothenburg- Germany.
- Barro R (2001). "Human capital and growth". Am. Econ. Rev. pp.91-92.
- Becker GS (1975). Human capital: A Theoretical and Empirical Analysis, with Special Reference to Education. University of Chicago Press. Chicago.
- Bigsten A, Isaksson A, Soderbom A, Collier P, Zeufack A, Dercon D, Facfchamps D, Cunning JW, Teal F, Gauthier B, Oduro A, Oostendorp R, Patillo C (2000). "Rates of retrain on physical and human capital in Africa's manufacturing sector"; Econ. Dev. Cult. Change 48: 801-827.
- Blundell R, Dearden L, Meghir C, Sianesi B (1999). "Human Capital

- Investment: The Returns from Education and Training to the Individual, the Firm and the Economy". *Fiscal Stud.* pp.20-21.
- Boyle P (1996). "Parents, Private Schools and the Politics of an Emerging Civil Society in Cameroon" *J. Modern Afr. Stud.* 34(4): 27-48.
- Bramley G, Karley KN (2005). "Home-Ownership, Poverty and Educational Achievement: Individual, School and Neighbourhood Effects", CRSIS Research Report, [www.crsis.hw.ac.uk](http://www.crsis.hw.ac.uk).
- Colclough C (2005). "Does Education Abroad Help to Alleviate Poverty at Home? An Assessment", *Pakistan Dev. Rev.* 44(4): 439-454.
- Coulombe H, McKay A (1996). "Modeling Determinants of Poverty in Mauritania", *World Dev.* 24(6): 1015-31.
- Dayton CM (1992). *Logistic Regression Analysis*; Department of Measurement, Statistics and Evaluation, University of Maryland.
- Desai S (1987). "The estimation of the health production function for low-income working men". *Med. Care* 25: 7.
- Dollar D, Kraay A (2002). "Growth is Good for the Poor", *J. Econ. Growth* 7: 195-225.
- Ewoudou J, Vencatachellum D (2006). "An Empirical Analysis of Private Rates of Returns to Education in Cameroon", Working Paper, November.
- Fonta MW, Omoke PC (2008). "Testing and correcting for sample selection bias in social science research: application to contingent valuation method (CVM) survey data", *Eur. J. Soc. Sci.* 6(2): 232-243.
- Greene WH (2003). *Econometric Analysis*, Pearson Education Inc, Singapore.
- Heckman JJ (1979). "Sample Selection Bias as a Specification Error" *Econometrica*, 47: 153-162.
- Hoffmann PJ (2004) *Generalized Linear Models. An Applied Approach*, Pearson Education Inc.
- Institut National des Statistiques (INS) (2001). *Living Conditions and Poverty Profile in Cameroon*, MINFI, Yaoundé, Cameroon.
- King K (2005). "Education, Skills, Knowledge and Word on the World's Development Agenda", 2005. Lecture delivered in royal African Society scotland edinburgh, centre of african studies, university of edinburgh, [www.cas.ed.ac.uk](http://www.cas.ed.ac.uk).
- Kingdon GG, Unni J (2001). "Education and Women.s Labour Market Outcomes in India"; *Educ. Econ.* 9(2): 173-195.
- Lam D, Duryea S (1999). "Effects of Schooling on Fertility, Labor Supply, and Investments in Children, with Evidence from Brazil"; *J. Hum. Resour.* 34: 1.
- Lanot G, Muller C (1997). "Dualistic sector choice and female labour supply: evidence from formal and informal sectors in Cameroon." Center for the Study of African Economies WPS pp.97-99.
- Manda D, Bigsten A (1998). "Changes to returns to education overtime in Kenya" Mimeo CSAE, Oxford University.
- Menard S (2000). "Coefficients of Determination for Multiple Logistic Regression Analysis". *Am. Stat.* 54(1) : 17-24.
- Ndjobo PMN, Kamgnia BD, Epo BN (2009). "Une Analyse Empirique de la Rentabilité Privée de l'Éducation au Cameroun : estimation d'un Modèle Tobit de Type III Structurel". A Paper presented at the Globelics Conference in Dakar, 2009 Senegal.
- Nguetse TP (2009). "Estimating the Returns to Education in Cameroon Informal Sector"; A Paper presented at the Globelics Conference in Dakar, Senegal.
- Okojie CEE (2002). "Gender and Education as Determinants of Household Poverty in Nigeria", Discussion Paper No. 2002/37, World Institute for Development Economics Research (WIDER).
- Psacharopoulos G (1994). "Returns to Investment in Education: A Global Update". *World Dev.* pp.22-29.
- Psacharopoulos G, Patrinos HA (2002). "Returns to Investment in Education: A Further Update", Working Paper No. 2881, World Bank, Washington D. C., September.
- Roberts J (2003). "Poverty Reduction Outcomes in Education and Health: Public Expenditure and Aid, Overseas Development Institute"; Working Paper No. 210, ODI, London.
- Rodriguez AG, Smith SM (1994). "A Comparison of Determinants of Urban, Rural and Farm Poverty in Costa Rica", *World Development*, 22(3): 381-97.
- Sianesi B, Van Reenen J (2002). "The Returns to Education: A Review of the Empirical Macro-Economic Literature". IFS Working Paper, 02/05.
- Söderbom M, Teal F, Wambugu A, Kahyarara G (2005). "The Dynamics of Returns to Education in Kenyan and Tanzanian Manufacturing", *Global Poverty Research Group Working Paper Series*, No. 017.
- Strazzera E, Scarpa R, Calia P, Garrod DG, Willis GK (2003). "Modeling Zero Values and Protest Responses in Contingent Valuation Surveys" *Appl. Econ.* 35: 133-138.
- Tafah EO (1998). "Rates of Return to Education: A Case of Cameroon" Unpublished paper, Department of Economics, University of Yaounde II, Soa.
- Taubman P, Rosen S (1982). "Healthiness, Education, and Marital Status". NBER Working Paper, W0611.
- Tilak JBG (1994). *Education for Development in Asia*. New Delhi: Sage Publications.
- Tilak JBG (2002). "Education and Poverty", *J. Hum. Dev.* 3(2): 191-207.
- Trostel P, Walker I, Woolley P (2002). Estimates of the Economic Return to Schooling for 28 Countries., *Labour Econ.* 9: 1-16.
- UNDP (2003). *Human development report*; Oxford University Press 198 Madison Avenue, New York, New York, 10016.