

Does Education Reduce Poverty? Response from Cameroon

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The abatement of poverty in all its forms requires economic progress. Lack of education reduces the earning abilities of individuals. This study investigates the impact of education attainment on poverty in Cameroon in 2007. The study employed a logistic regression model to investigate the probability of an individual being poor using gender, work experience and education levels of education as explanatory variables. The estimated coefficients show that with the exception of primary education, which has no impact on poverty reduction, the other variables are negatively related to the probability of being poor. This indicates that as one's level of education increases, the probability of being poor decreases. The study also found that the reduction in the probability of being poor as educational level increases impacts women more than men.

JEL Codes: I20, I29, I30 and I39

1. Introduction

The evidence that education can substantially enhance the earning abilities of the individual, thus reducing poverty has been widely examined in the literature. Poverty is a multidimensional concept: it is not only the lack of financial resources, but also, the lack of capability to function effectively in society. Inadequate education or income, poor health, insecurity, low self-esteem, sense of powerlessness or the absence of rights such as freedom of speech are different dimensions of poverty that must be taken into account when designing poverty reduction measures (Sen 1992). There is a positive correlation between education level and income earning abilities. Increased levels of education thus increase economic opportunities and growth. Education also increases social benefits that improve economic development and the conditions of the poor (Haughton and Khandker 2009).

With the support of the international community, the Cameroonian government has adopted strategies to reduce poverty in all its dimensions, among which expanding access to primary education is a key component. In 2003, Cameroonian authorities designed and implemented an education sector strategy, a key building blocks in the Poverty Reduction Strategy Paper (PRSP). Member countries in consultation with the stakeholders and development partners such as the International Monetary Fund and the World Bank prepare PRSPs. These papers describe the macroeconomic, structural and social policies in respective countries in support of growth and poverty reduction (IMF 2003).

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The education sector policy seeks to attain the Millennium Development Goals (MDGs) namely, to raise access to primary education, raise the completion rate to 100 percent by 2015 and to reduce gender disparities in enrolment. Specifically, the strategy would expand universal access to primary education, improve access and equity at other levels of education, improve the quality and the relevance of school programs, and also improve the management of the school system. The government has begun the implementation of certain aspects of the education strategy notably the recruitment of more teachers and the integration of teachers who were previously working under contract into the public service. Also, the management of the school system is also being improved through decentralization and the involvement of Parents-Teachers Associations (PTAs) in decision making and governance.

Despite the progress made so far, the distribution of educational opportunities and achievements continues to favor higher income families. Since equity in the distribution of education correlates with reduced economic poverty and faster economic growth, low educational attainment is necessarily a contributing factor to poverty in Cameroon. Due to the absence of any other study that relates poverty to education using the 2007 Cameroon Household Survey, this study seeks to investigate whether educational attainment is related to reduced economic poverty in Cameroon.

The central objective of this study is to identify the relationship between educational attainment and poverty. According to the 2007 Cameroon Household Survey, 39.9 percent of the Cameroon population fell below the poverty line estimated at 269,443 FCFA compared to 40.2 percent in 2001 where the established poverty line was at 232,547 FCFA (IMF 2003). The authorities have initiated and implemented various poverty reduction strategies since the 2001 Cameroon Household Survey such as expanding access to education and improving on the quality of educational programs. Understanding how educational attainment and poverty are related is therefore crucial in assessing the effectiveness of poverty reduction policies.

In order to determine the link between educational attainment and poverty, we specify and estimate a logistic model in which the dependent variable is a dichotomous variable which assumes a value of one if an individual is poor and zero, otherwise. We also include a set of explanatory variables that to affect the poverty levels. The results from the model estimation should serve as a useful guide to designing and implementing policies aimed at reducing poverty.

The rest of the sections are organized as follows: Section 2 provides an overview of poverty and education in Cameroon. Section three gives a brief review of the relevant literature. The data and methodology are discussed in section four. Section 5 presents the results as well as a discussion of the results. Section 6 is devoted to the conclusion and general findings.

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2. Poverty and Education in Cameroon: An Overview

2.1 Characteristics of the 2001 and 2007 Poverty Profiles in Cameroon

In the 2001 and the 2007 household surveys, the Department of Statistics estimated the poverty lines of 232,547 CFA francs and 269,443 CFA francs per person per year respectively. These poverty lines distinguished the population into poor, with an adult equivalent that is below the poverty line, and the non-poor, with expenditures greater than the poverty line. Table 1 below shows the poverty indices for Cameroon as a whole, for urban and rural areas, as well as for the two large metropolises of Douala and Yaounde. The table shows the disparities in the distribution of poverty across the social strata of the population. Between 2001 and 2007, poverty decreased in urban areas, and the metropolis of Douala and Yaounde by 5 points. Poverty rose, however, by 3 points in rural areas. The poverty headcount index shows that more than half of the population living in rural areas in 2001 and 2007 were poor compared with only 17.9 percent and 12.2 percent of the urban population in the respective years.

Table 1: Poverty Profile of Cameroon in 2001 and 2007

Strata	2001			2007		
	Poverty headcount(P0)	Poverty gap(P1)	Poverty severity(P2)	Poverty headcount(P0)	Poverty gap(P1)	Poverty severity(P2)
Urban	17.9	4.3	1.6	12.2	2.8	1.0
Rural	52.1	17.3	7.7	55.0	17.5	7.2
Douala	1.9	2.1	0.7	5.5	0.9	0.2
Yaounde	13.3	2.7	0.9	5.9	1.0	0.2
Cameroon	40.2	12.8	5.6	39.9	12.3	5.0

Source: IMF (2010) Cameroon: Poverty Reduction Strategy Paper (Based ECAM II, ECAM III and NIS reports)

The table also shows the remarkable decline in the incidence and severity of poverty in the cities of Douala and Yaounde between 2001 and 2007. According to the IMF's Cameroon Poverty Reduction Strategy Paper report of 2010, almost 94 percent of the poorest quintile lives in rural areas compared to only 2 percent in Yaounde and Douala and only 6 percent in other cities respectively. This disparity is most likely the result of the differences in access to revenue by various populations. The overall results indicate that poverty is pervasive in Cameroon and is predominantly a rural phenomenon. The severity index P2 also shows that poverty is more severe in rural areas and male-headed households.

2.2 Distribution of Poverty According to Level of Education

At the national level, about 73 % of the head of households interviewed had some level of education. Approximately 73% of the population was literate and roughly 30% had a

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primary education level. This implies that almost 40% of the population went beyond the primary level of education (IMF 2003). The calculations in the table below confirm that the non-poor had more education at all levels than the poor.

Table 2: Poverty and level of education, 2007

Level of education	Poor	Non-poor	Difference
No Education	45.2	54.8	9.6
Primary	36.4	63.6	27.2
Secondary gen 1st cycle	19.8	80.2	60.4
Secondary gen 2nd cycle	10.1	89.9	79.8
Secondary technical 1 st cycle	21.5	78.5	57.0
Secondary technical 2nd cycle	8.7	91.3	82.6
Higher education	2.3	97.7	95.4

Source: Calculated by the authors from ECAM 3, 2007 survey data.

Table 2 shows the distribution of individuals according to level of education and according to the standards of living. About 45.2 percent of individuals who were reported to have no education were poor compared to 54.8 who were considered better-off, thus indicating a gap of 9.6 percent. Of individuals who completed primary school, 36.4 percent were considered poor compared to 63.6 that were not poor. The evidence therefore indicates the higher the level of education the lesser the level of poverty for the individuals included in the survey.

Those individuals who had successfully completed high school in a technical institution were more likely to live above the poverty line (91.3 percent) compared to those that with a general education but no specific professional training (89.9 percent). The percentage of individuals that attained higher education and were not poor was 97.7 percent compared to only 2.3 percent that had attained higher education but were still poor. This outcome indicates that graduates from higher levels of education have better chances of getting well-paid jobs and better earning opportunities than those with no education or only primary education.

The distribution of education levels according to poverty category and according gender is shown in Table 3. This table shows the disparities in education attainment and poverty among men and women. As the table indicates, females who had attained primary education were more affluent than men. 37.3 percent of men in this group compared to 34.2 of women, in this same group, lived in poverty. This was the case at all other levels of education, strongly implying that education has higher returns for women than for men.

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Table 3: Level of Education according to poverty category and by gender

Level of education	Men			Women		
	Poor	Non-poor	Difference	Poor	Non-poor	Difference
No Education	44.2	55.8	11.6	45.8	54.2	8.4
Primary	37.3	62.7	25.4	34.2	65.8	31.6
Secondary gen 1st cycle	22.0	78.0	56.0	17.7	82.3	64.6
Secondary gen 2nd cycle	11.6	88.4	76.8	8.2	91.8	83.6
Secondary technical 1 st cycle	24.2	75.8	51.6	18.4	81.6	63.2
Secondary technical 2nd cycle	9.9	90.1	80.2	6.4	93.6	87.2
Higher education	3.0	97.1	94.1	1.2	98.8	97.6

Source: Calculated by the authors from ECAM 3, 2007 survey data.

3. Literature Review

The relationship between education and economic growth has been widely examined in the literature (Filmer and Pritchett 1999; Krueger and Lindahl 2001; Levine and Renelt 1992; and Barro and Lee 2001). Amartya Sen (2001) defined poverty as a condition that results from the absence of the freedom to choose and this limits the capability to function effectively in society. This multidimensional interpretation implies that poverty is not solely related to lack of financial resources but following Sen's viewpoint, inadequate education could also be considered as a form of poverty in many societies. This seems quite plausible because education is a very important step in the development process of a country and provides the foundation for the socioeconomic development. An increase in economic growth can significantly reduce poverty implying that higher levels of education can lead to sustained growth and the reduction of poverty (Moaz and Neeman 2008; Chaudhry and Rahman 2009). Sianesi and Reenen (2000) argued that human capital and education, which does not merely signal qualification of a job, enhance productivity. Highly educated individuals are more productive and also earn higher wages.

Based on empirical evidence, Barro (1991) argues that investment in education is critical for economic growth and that there is a strong correlation between education enrollment and economic growth. In an earlier study Tilak (1986) came to similar conclusions in a study of the relationship between schooling and economic growth in Pakistan and South Korea. Babatunde and Adefabi (2005) argued that education stimulates economic growth thus enhancing employment opportunities, reducing poverty, improving development in technology and increasing political stability.

Lin (2004) investigated the effects of higher education curricula on labor and economic growth in Taiwan over the period from 1965-2000. The study revealed that higher education positively and significantly affects higher education stock, which is

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associated with an increase in real output. This outcome confirms the reciprocal relationship between poverty and education: the poor are unable to obtain access to education and individuals with little or no education are caught in the mire of poverty.

Following the work of Psacharopoulos and Patrinos (2004) that education at the primary level seemed to have the highest level of returns than other levels. Recent studies, however, present mixed evidence. While some studies continue to show that primary education has higher returns than the secondary and tertiary levels, others show that returns are higher at the secondary and tertiary levels than at the primary level.

Chaudhry et al. (2010) investigated the role of education in poverty reduction in Pakistan. The results of the study revealed that primary and middle school education is positively and insignificantly related to poverty. Tafah-Edokat (1998) studied private returns to investments in education in Cameroon and concluded that returns on education at the primary level are highest followed by secondary and higher education. In a more recent study, Amin and Awung (2005) analyzed private returns on investment in education in Cameroon and concluded that the returns to education increased from lower to higher levels.

The existing studies examining the relationship between education and poverty used differing methodologies. Afzal et al. (2012) for example used a Johansen cointegration approach on time series data in Pakistan to determine the relationship between education, poverty and economic growth, while Maliki, et al. (2012) used a multinomial econometric model, using non-scholastic factors as the main determinants of the relationship between poverty and education. Amongst the sets of limited dependent variable models, the logit model is the most appealing specification because of its simplicity and will be applied in this study.

4. Data and Methodology

4.1 Data

The third Cameroon Household Surveys (ECAM III) was conducted across the ten Provinces of Cameroon by the National Institute of Statistics with the support of the World Bank in 2007. It was a multipurpose household survey covering all 10 provinces of Cameroon and was conducted in both urban and rural areas. ECAM III measured socio-economic factors relevant to the standards of living for rural, urban and semi-urban households. It also gathered information on household characteristics, expenditures, and consumption of goods and services which included health and education services.

A three-stage sampling design was adopted for the sampling process and it was geographically stratified to ensure that the entire sample was representative at all levels. In the first stage of the sample design, the sampling strata were selected as primary sampling units with equal probabilities based on the counting zones of the last population census of April 1987. The counting zones were subsequently updated to

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account for the changes that had taken place since 1987, particularly in the urban areas. The National Institute of Statistics selected 22 strata for the survey, with the major cities of Yaoundé and Douala being treated as separate strata. The areas sampled were urban, semi-urban and rural. In the third stage, surveyors randomly selected household samples from each of the selected counting zones with equal probabilities.

The poverty line established by the 2007 Cameroon Household Survey was 269, 443 FCFA per year or 738 FCFA per day per adult equivalent. All individuals with incomes below this threshold were considered poor and all with incomes above this threshold were considered non-poor. Individuals with varying education levels and with employment at least one year prior to the time of the survey comprised the sample.

4.2 Methodology: The Logit Model

Based on the data from the survey, we apply a simple logit model to determine the links between education and poverty reduction. The study therefore tests the hypothesis that the likelihood that an individual will be poor will decline as the individual's level of education increases. We employ a logistic model in which the dependent variable (Y) is a dichotomous variable which takes the value 1 if the employed person is poor and 0 if not. The logit model predicts the logit of the categorical outcome variable from a set of predictor or explanatory variables. The logistic model has the following form:

$$\log \text{it}(Y) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_{1i} + \beta_{2i} X_{2i} + \dots + \beta_{k-1} X_{k-1} + \beta_{ki} X_{ki} + \varepsilon_i \quad (1)$$

where β 's, are the parameters in the regression model and the X's are the explanatory variables and ε is the error term. The logit is the natural logarithm (ln) of the odds of Y, and the odds $\left(\frac{P}{1-P}\right)$ are the ratios of the probabilities (P) of Y happening (an employed individual is poor) to the probabilities (1- P) of Y not happening (an employed individual is not poor).

Taking the antilog of equation (1) on both sides, we derive an equation for predicting the probability that an employed individual is poor as follows:

$$P = \Pr(Y = 1/X_1 \dots X_k) = \frac{\exp(\beta_0 + \beta_1 X_{1i} + \beta_{2i} X_{2i} + \dots + \beta_{k-1} X_{k-1} + \beta_{ki} X_{ki})}{1 + \exp(\beta_0 + \beta_1 X_{1i} + \beta_{2i} X_{2i} + \dots + \beta_{k-1} X_{k-1} + \beta_{ki} X_{ki})} = \frac{e^{\beta'X}}{1 + e^{\beta'X}} \quad (2)$$

The value of the coefficient β determines the direction of the relationship between the predictor variables and the logit of the categorical outcome variable. When $\exp(\beta) = b > 1$ a unit change in the value of Xi would make the event b times as likely to occur as is non-occurrence. An increase in work experience for example will most

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likely reduce poverty by b times. Similarly, $\exp(\beta) = 1$, an increase in the level of education or work experience will likely be associated with a 50% reduction in poverty.

4.3 Estimation Technique

The coefficients β 's are estimated by way of the maximum likelihood (ML) method. The ML is designed to maximize the likelihood of reproducing the data given the parameter estimates. Given that the binary response variable is $Y_i = 1$ with probability P_i and $Y_i = 0$ with probability $1 - P_i$. The general form of the likelihood function is given as:

$$L(\beta) = \prod_{i=1}^N P_i^{Y_i} (1 - P_i)^{1 - Y_i} \quad (5)$$

The logistic models for P_i and $1 - P_i$ are respectively, $P_i = \frac{e^{\beta'X}}{1 + e^{\beta'X}}$ and $1 - P_i = \frac{1}{1 + e^{\beta'X}}$.

Replacing these in equation (5) yields the following likelihood function:

$$L(\beta) = \prod_{i=1}^N \left(\frac{e^{\beta'X}}{1 + e^{\beta'X}} \right)^{Y_i} \left(\frac{1}{1 + e^{\beta'X}} \right)^{1 - Y_i} = \prod_{i=1}^N \frac{(e^{\beta'X})^{Y_i}}{(1 + e^{\beta'X})} \quad (6)$$

The estimation process involves finding the values of β 's that maximizes the likelihood function in equation (6). However, it is cumbersome to estimate and can be simplified by taking the natural logarithm of the likelihood. Thus the log-likelihood equation (6) yields the log likelihood function as follows:

$$\text{Log}L(\beta) = \sum_{i=1}^N Y_i (\beta'X) - \sum_{i=1}^N \log[1 + e^{\beta'X}] \quad (7)$$

The null hypothesis underlying the overall model states that all β 's equal zero or that the predictor variables; work experience, gender, primary level, secondary level, high school, Technical secondary, and university do not influence the likelihood of being poor). A rejection of the null hypothesis implies that the model is acceptable in studying the relationship between poverty and education. The interpretation is done using odds ratio for both categorical and continuous predictors.

4.4 Definition of Regression Variables

The dependent variable (Y) is a dichotomous variable which takes the value 1 if the employed person is poor and 0 if not. Work experience is an explanatory variable calculated as the age of the individual minus the school starting age, minus the number of years spent at the relevant level of education attained by the individual. Gender is a dummy variable that takes the value 1 if the individual is a man and zero, if the individual is a woman. The primary, secondary, high school, technical secondary,

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and university levels are the relevant degrees of education successively attained by the individual.

5. Regression Results and Discussion

We investigated the relationship between educational attainment and poverty by estimating the probability of being poor on experience and the different levels of education for individuals that were employed during the last twelve months prior to the survey. The results for the whole sample can be seen on Table 4. The results for men and women are shown respectively on Tables 5 and 6.

Table 4: Logistic Regression of being poor with multiple independent variables (All)

Variables	Coefficient	Z-values	Odd-Ratios	P> Z
Experience	-0.0108	-7.68	0.9892	0.000
Male	0.1997	5.63	1.2210	0.000
Primary	0.7908	13.32	2.2052	0.000
Secondary (General)	-0.0412	-0.62	0.9596	0.534
High School (General)	-0.8128	-10.52	0.4435	0.000
Technical Secondary	-0.9724	-7.57	0.3782	0.000
University	-2.3216	-13.46	0.0981	0.000
Constant	-1.3904	-23.66	0.2489	0.000

*With the exception of primary education, and gender, the rest of the coefficients are significant in the Wald Test.

The coefficients of the levels of all levels of education with the exception of the primary level of education are negative in the three samples. For the whole sample, the odd ratios show that the probability of being poor would decrease by 4 percent, 55.6 percent, 62.2 percent and 90.2 percent respectively for secondary general, high school general, secondary technical, and university education levels respectively. Generally, as is expected, better education enables individuals to become more productive and to obtain better paying jobs.

The odds for primary education is 2.21 which implies that employed individuals with only primary level of education are two times more likely to be poor. Without the expected negative sign, the result indicates that completing primary education does not enable individuals to get lucrative jobs. The odds of being poor compared to not being poor are increased by 1.22 for women, controlling for other variables in the model.

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Table 5: Logistic Regression of being poor with multiple independent variables (Men)

Variables	Coefficient	Z-values	Odd-Ratios	P> Z
Experience	0.0085	-4.70	0.9915	0.000
Primary	0.6722	8.51	1.9586	0.000
Secondary (General)	-0.0241	-0.27	0.9761	0.786
High School (General)	-0.7716	-7.82	0.4623	0.000
Technical Secondary	-0.8995	-5.85	0.4067	0.000
University	-2.1532	-11.19	0.1161	0.000
Constant	-1.1829	-16.19	0.3064	0.000

*With the exception of primary education, the rest of the coefficients are significant in the Wald Test

Estimated coefficients and odds were also obtained for a sample of men who were selected for the survey and the results indicate that education attainment reduces the probability of being poor when one moves up the educational ladder. The odds ratios show that the probability of being poor declined by 2.4 percent, 53.8 percent, 59.3 percent, and 88.4 percent respectively for secondary general education, high school general, secondary technical and University education.

Table 6: Logistic Regression of being poor with multiple independent variables (Women)

Variables	Coefficient	Z-values	Odd-Ratios	P> Z
Experience	-0.0143	-6.42	0.9857	0.000
Primary	0.9309	10.31	2.5370	0.000
Secondary (General)	-0.0530	-0.53	0.9484	0.597
High School (General)	-0.8993	-7.19	0.4068	0.000
Technical Secondary	-1.1826	-4.93	0.3065	0.000
University	-2.9768	-7.11	0.05095	0.000
Constant	-1.3975	-16.26	0.2472	0.000

*With the exception of primary education, the rest of the coefficients are significant in the Wald Test

The estimates of the sample of women show similar results with the first two estimates. The odds ratio show that secondary general, high school general, secondary technical and university education reduces the probability of poverty by 5.2 percent, 5.9 percent, 69.4 percent, and 94.9 percent respectively for secondary general, high school general, secondary technical, and university education levels. As was the case in the

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first two estimations, the results from the sample of women support the claim that higher levels of education entail better earnings and lower levels of poverty. Experience is an important variable that appears in all the regressions. The negative assign of the experience variables indicates that a one year increase in experience will lead to a reduction in poverty by 1.08 percent, 0.8 percent, and 1.4 percent respectively for the sample as a whole, as well as the separate samples of men and women. The experience of women appears to be greater than that of males. The negative results for various levels, with the exception of primary education, generally indicate that education levels play an important role in poverty reduction in Cameroon.

6. Summary and Conclusion

The purpose of this study was to investigate the impact of education on poverty reduction in Cameroon. The study employed data that was collected from the 2007 Cameroon household survey (ECAM III). The dependent variable is a dichotomous variable, which is equal to one if the person is poor and zero, otherwise. The results of the regression are consistent with the assertion that educational attainment plays a substantial role in poverty reduction. As one moves up the educational ladder, the level of achievement increases, along with the individual's the earning ability. As the earning ability of the individual increases, the probability of being poor will decline. The estimated coefficients also show that as one's experience increases, the likelihood of the person being poor decreased.

This study has also produced startling results as regards gender. The probability of being poor is higher for women than it is for men. The probability of reducing poverty as one attains higher levels of education, however, is greater for women than for men. It follows that education could serve as an effective way of empowering women, emphasizing the key role education could play in reducing the gender bias in earnings among males and females, rendering them more productive, and ultimately help to reduce poverty.

This study used micro-level household data to determine that households and individuals with better education achievements are less likely to be poor. Macro-evidence on how educational attainment affects growth should yield useful insights in developing poverty reduction related policies at the macro level. The rationale is that education can promote growth or economic success which is inversely related to poverty.

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