POLICY BRIEF

# Heterogeneity in Returns to Schooling in Cameroon: An Estimation Approach Considering Selection and Endogeneity Bias

*Njifen Issofou* and
*Pemboura Aicha*

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## Abstract

The aim of this study is to show that the rate of the returns to education is not uniform, and that some people benefit most and others least from their education on the labour market. Using data from a survey on employment and the informal sector, the study provides evidence of the heterogeneity of the returns to education in Cameroon. By controlling for any selection bias attributable to endogenous choices of the employment sector in the school-to-work transition and the potential endogeneity of the education variable related to the individual unobserved heterogeneity, we used the ordinary least squares

with robust standard errors and the quantile regression technique to estimate the Mincer earnings function. This estimation procedure based on the control function is suitable because of the robustness of the instruments used. Overall, the study found that the average rate of the returns of an additional year of education was 7.1%. The results of the quantile regression model showed that the returns to education differed according to the earnings quantile considered: they were highest for the highest-paid workers and lowest for the middle-income ones. In addition, the individual unobserved heterogeneity was observed to decrease the returns to education. The Wald test for the equality of coefficients significantly confirmed the heterogeneity of the returns to education by quantile. The study's findings have many socioeconomic policy implications.

# Introduction

Over the last three decades, the economics of education has seen a renewal of issues relating to schooling returns. Thanks to micro-econometric development, empirical studies of the returns to education have increased manifold in various fields. In this connection, studies on economic growth have addressed the issue of the role of education in productivity and economic growth (Charlot, 1997; Hugon, 2005). Researchers who have studied inequality and poverty have sought to understand how investing in education can improve the incomes of the poor (Arestoff & Sgard, 2012). On the other hand, studies that have analysed the issue of optimal distribution of resources have made it possible to determine the expected returns on investment in education, that is, the wage benefits which people can gain on the labour market because of their schooling. For both individuals and society, returns to education remain at the centre of discussion in economic literature.

Private returns to education have been researched in several African countries (Schultz, 2004). While there is no doubt about the positive relationship between education and wages, the question of whether education affects people differently has been given comparatively little attention[1]. From a methodological viewpoint, most studies reported in the literature have focused on average modelling (Arestoff, 2001; Nga Ndjobo et al., 2011). They have been much criticized because this approach provides essential but limited information (D'Haultfœuille & Givord, 2014). That is because an average income does not provide information on the unequal distribution of income within a population. For example, an additional year of education benefits some people more than others on the labour market.

Due to the complementarity between people's education and their ability, the returns to education will differ in the distribution of wages. If, for example, the most

1 See Wang (2013).

able people earn more, this could be explained by the high returns at the top of the wage scale. That is why an estimate to average opens to criticism when outliers or censored data are considered. For various reasons, numerous studies have revealed the heterogeneous effects of education on wages in several African countries (Mwabu & Schultz, 1996; Girma & Kedir, 2005; Fasih et al., 2012; Baye, 2015; Kavuma et al., 2015). In the human capital theory, education is considered an investment in a durable consumer good (Lemelin, 1998), which improves workers' productive capacities (Schultz, 1961). On the assumption that remuneration is equal to marginal productivity, the neoclassical analysis of the rate of returns to education ignores unemployment problems and refers almost exclusively to the prevailing wage rate on the labour market (Lemelin & Otis, 1978).

The labour market does not adjust instantly; it is affected by the existence, if not the persistence, of situations of surplus or shortage (imperfection) which determine the private returns to education (Schultz, 2004). In a shortage situation, skill underutilization leads to the devaluation of human capital (Njifen, 2018). Indeed, when underutilized workers work fewer hours than they would like to, they will earn less. Furthermore, in developing countries, markets are not only imperfect, but the nature of employment contracts also significantly influences the relationship between human capital endowment and remuneration. The existence of a wide informal sector which significantly contributes to job creation greatly influences the effect of education on wages. Some authors have shown that the returns to education in the formal sector are higher than those in the informal sector (Pradhan & van Soest, 1997).

Based on certain stylized facts, it is necessary to carry out a case study on heterogeneity in the private returns to education in the Cameroonian context. Firstly, the level of underemployment and the expansion of the informal sector are likely to generate low-paid jobs. Indeed, in Cameroon, informal jobs represent 91 percent of the total jobs, and the rate of underemployment is around 70 percent. Secondly, a combination of population growth and the transition to free primary education in 2001 has led to a massive increase in the total numbers of children in school. Net primary and secondary school enrolment rates increased from 66 percent and 14 percent in 1980 to 92 percent and 44 percent in 2015, respectively.[2] Lastly, the country's level and efficiency of education spending is not adequate to ensure educational quality. Non-salary expenditure on school supplies and facilities represents only 15-20 percent of the total education expenditure (Banque Mondiale [World Bank], 2017).

At the same time, the proportion of primary school teachers paid by parents increased from 25 percent in 2009 to 38 percent in 2016. In addition, the reforms that became necessary following a significant increase in the number of students over the past three decades have led to an increase in the number of universities and private higher

2 Source: UNESCO Institute for Statistics.

education institutions. Regardless of the number of jobs available, the number of graduates per year has been increasing dramatically.[3] Against this backdrop of a decline in employability, where the poverty rate was around 37.5 percent in 2015 and the vulnerable employment rate was 73.6 percent in 2010, it is only fitting to ask whether an additional year of schooling produces the same benefits for all employees on the labour market. Otherwise, who benefits most from the returns to education?

The aim of the present study is to analyse heterogeneity in private returns to education using an estimation approach in the presence of selection and endogeneity bias. More specifically, it seeks to show that:

(i) the frequency of (un)occupied labour force from another household in the vicinity determines the participation of an individual as wageworker on the labour market;

(ii) the frequency of wageworkers in another household determines the choice of employment sector;

(iii) the average level of education per household in the residence area of individuals is a determining factor in the demand for education;

(iv) education benefits the highest-paid more than the lowest-paid employees and the education endogeneity bias related to the individual unobserved heterogeneity significantly decreases the returns to education. While issues related to profitability of education have been widely studied, the present study is the first one to consider the issue of double selection in the participation to labour market. It is equally the first to use a "non-self-cluster mean" as potential instrument in the identification process of the specified econometric model.

The use of this type of instrument is of proven relevance. The "non-self-cluster mean" variables, although rarely used in the literature, are suitable instruments to the extent that, by definition, they are not correlated with the error term and are strongly correlated with the instrumented variable (Handa, 1996). They are values corresponding to a given (instrumented) endogenous variable, calculated as an average for all the other households in a community, that is, without the score of the reference household. Theoretically, such community-level variables, unlike the individual-level ones, generally satisfy the exclusion and orthogonality conditions of a good instrument. For each regression analysis carried out, namely regarding the selection model, the multinomial probit of employment sector choice and the function of education demand, a non-self-cluster mean will be computed.

3 Njifen's (2018) study reports that, in the higher education sector, the number of students had risen from 213 in 1962 to 244,233 in 2011. This dramatic increase in numbers led to university graduation of 21,737 students in 2005, 32,025 in 2008, and 53,138 in 2011.

# Data sources

The data used in the present study come from the national survey on employment and informal sector carried out in 2010 by the National Institute of Statistics.[4] This survey is a national statistical operation carried out in two phases. The first stage concerns the data collection on working conditions, distribution of wages, employment details and demographic profile of households' members while the second provides information on informal units[5] identified during the first one. The sampling frame used comes from the cartography work done for the third national population and housing census in 2005. This survey was aimed to grasp the activity situations of labour force[6] in the three main sector of employment (public, private and informal sectors). Geographically, this national survey provides information on census areas, regions, and residence area of individuals.

From a descriptive point of view, the database provides comprehensive information of around 38,599 individuals whom 50.23% of women and 49.77% of men; 41.3% of individuals in database belonged to the working population, 3.08% of whom were unemployed (ILO definition), and 1.32% discouraged workers, while 58% were inactive population. In terms of location area, 57% resided in urban areas and 43% in rural ones. About the allocation into the sectors of employment, 35% of them were employed in the informal sector while 3.11% were in the formal private sector and 3.2% in the public sector. According to age group, 21,490 of individuals were young people (under 35 years old) and 12,820 were adults (35 years and above). Descriptive statistics revealed that 71% of workers were salaried and some of whom were in double employment. The average monthly earnings generated by the main and/or secondary employment amounted to XAF 75,215.

Table 2 shows the percentile points of the monthly earnings distribution. The percentile monthly earning, or wage is the monthly earning value which delineates the lowest p% of all the employees concerned, where p can be any integer value from 1 to 99. In the table above, the monthly earning value that delineates the lowest

4 National Institute of Statistics is the structure mandated to build up statistical database in Cameroon.

5 The concept of informal sector adopted here for this survey is that used for the 1993 national accounting system (which is a set of international standards aimed at establishing a framework to produce statistics for national accounts). The distinction between activity sectors depends on the nature of the firm, according to criteria related to issues of administrative registration and formal accounting procedures.

6 According to international recommendations, the working-age population is all individuals aged 15 and above.

25% of employees considered as lowest paid employees was XAF 30,000 while the earning value that delineates the upper 10% of employees considered as highest paid workers was XAF 154,900. The median monthly pay for employees (the wage in the middle that is half of workers (50%) below this level) was XAF 43,000; thus, 50% of employees earned less than XAF 43,000. The interquartile ratio shows that the 10% highest paid employees earned about 6.7 times the earnings of the 10% lowest paid.

**Table 2: Distribution of monthly earnings by quantile**

| Number of observations | Percentile | Earnings |
|---|---|---|
| 7,470 | 10th (D1) | 23,022.03 |
| 7,470 | 25th (Q1) | 30,000 |
| 7,470 | 50th (Q2) | 43,000 |
| 7,470 | 75th (Q3) | 99,000 |
| 7,470 | 90th (D9) | 154,900 |
| Interquartile ratio (Q3/Q1) | 3.301 | |
| Interdecile ratio (D9/D1) | 6.72 | |

Source: authors calculation.

# Conclusion and policy implications

The aim of this study was to analyze the heterogeneity of the returns to education in Cameroon. To achieve it, approach consisting of estimating both the average rate and the quantile rate of returns to additional year of education is used. Specially, study recourse the ordinary least squares estimator. Usually, this technique is riddled with many econometric problems, in particular the potential endogeneity of the education variable in the wage equation and the possible selection bias attributable, not only to participation in the labour market, but also to the endogenous choice of the employment sector. To control for such limitations, the study estimated an earnings model augmented with selectivity and endogeneity-corrected terms. In particular, the quantile-regression-model estimates are associated with robustness properties which make the obtained results very pertinent. The unobserved heterogeneity effect on returns to education was also measured and a post-estimation Wald test was done to confirm the heterogeneous nature of returns to education in Cameroon.

Overall, the study found that there was a positive correlation between years of education and monthly earnings. The average rate of returns to an additional year of education was 7.1%. However, this result masks disparities in returns to education across social categories: low-income earners (poor workers), middle-income earners and high-income earners (rich workers). Quantile analysis revealed differentiated effects of education in the earnings distribution.

The rate of returns to education was found to increase from the bottom to the top. It was found to be 6.8% in the first quartile (25th percentile). Likewise, the rate of returns to an additional year of education for the middle-income workers, that is those with median earnings, was 4.9%. It was 7.9% in the third quartile (75th percentile). Clearly, between the first quartile (25th percentile) and the third (75th percentile), the rate increased, from 6.8% to 7.9%. And between the first quartile (25th percentile) and the ninth decile (90th percentile), the rate of returns also rose, from 6.8% to 9.6%. However, education was not found to be profitable for employees at the bottom (1st decile) of the earnings distribution. The highest-paid workers benefited most from their investment in education. Further, the individual unobserved heterogeneity significantly reduced returns to schooling.

In terms of policy implications, the results from the quantile analysis are quite relevant. With the returns to education being positive, families can make an efficient investment in the human capital of their children to maximize their wealth. It follows therefore that there is still a need to focus public investment on the poor. To reduce household poverty, it is necessary to reduce inequality in access to education. On average, the poorest households educate their children only up to the primary school level, while the wealthiest families can afford to do so up to higher education.

Developing educational policies and setting up incentives should enable low-income families to invest in the education of their children even at higher levels. As part of the policies aimed at promoting education, and therefore improving earnings on the labour market, greater emphasis should be placed on both measures for combating gender inequalities in terms of education duration and those for combating geographical disparities (urban vs. rural) in access to education. In other words, decision makers should strive to improve the educational environment and education in rural areas and, above all, to encourage girls' education.

In addition, they should prioritize the fight against poverty with a view to improving household living conditions, given the fact that the learning environment that educated parents can offer to their children affects the latter's educational level. Finally, education helps individuals to adjust to the dominant values of society. In return, these lead to social transformation through the transmission of new societal values.

The second implication concerns the labour market functioning. Education is not valued among the lowest-paid workers, most of whom will be found in the informal employment sector, where the level of education is not valued, and where returns to education are lower than in the private sector and the public sector. Improving the profitability of education on the labour market requires the formalization of the informal sector, which is predominant in Cameroon's economy (around 91%).

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3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@aercafrica.org