The Effect of Education on Households Spending Choices and Poverty Status in Burkina Faso: Evidence from the 2009 Survey on Household Living Conditions

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Abstract

This study contributes to the overall debate on education and development, and is concerned with analyzing the effect of educational attainment on household's per capita spending choices, and the reaction of those spending choices on household's poverty status in Burkina Faso. In this formulation, a household is said to be experiencing monetary poverty if its annual per capita consumption spending is less than the poverty line of 130,375 CFA Franc. The study uses the 2009 National Survey on Household Living Conditions, along with a Random Utility Theory to explain household's per capita consumption choices and poverty status. The results show that education; along with other covariates are key determinants of households spending choices and poverty status in Burkina Faso. In fact, compared to households with uneducated heads, those headed by someone with a primary, secondary, and higher education are respectively 1.45 times, 4.13 times, and 18.04 times more likely to spend a per capita amount above the poverty threshold of 130,375 CFA franc. These results suggest that education could successfully be used as an effective policy tool to reduce the incidence of chronic poverty in Burkina Faso.

Keywords: Burkina Faso; Discrete Choice; Education; Poverty; Log it and JEL: C50, I20, I32, O50

Introduction

In the past few decades, substantial progress has been made in reducing global poverty. Between 1990 and 2011, the number of people living in extreme poverty has halved, to around one billion people, or 14.5 percent of the world's population [1]. While this progress is encouraging, so many people still remain poor [1]. This is why on April 2013, former World Bank President Jim Yong Kim announced to the international community two new goals to guide the World Bank's work. The rest, to end global poverty by reducing the share of people living in extreme poverty to 3 percent of the global population by 2030; and the second, to boost shared prosperity, understood as increasing the average incomes of the bottom 40 percent of the population in each country [2]. The two goals seek to provide a new framework in which to evaluate policies and their potential contribution to poverty reduction and inclusive growth. Several studies have looked at this link between education, poverty reduction and sustainability [3-7]. It is believed that education by allowing for greater productivity, improves quality of life, and provides a way out of poverty [8]. For example, a study by [9] in South Africa suggests that each year of additional primary schooling leads to an increase in consumption spending by 11% [10] also found a strong correlation between education and poverty reduction.

In rural Vietnam et al. [11] found that households led by heads with secondary education, have 31% higher chances of coming out of poverty compared to those headed by someone with no formal schooling McCulloch et al. [12] had similar sending's in Indonesia, where each year of schooling translated into a 6% growth in income for the 7 years spanning the study. Finally Lachaud [13] found that families with uneducated heads have three times more chances of being poor, than those with heads having completed at least their secondary education. Understanding this potential of education for fighting against poverty, the Inchon Declaration [14] was adopted in May 2015 at the World Education Forum, to represent the term commitment of countries and the global education community to a single, renewed education agenda Education 2030. The heart of this agenda lies at the country level with governments having the primary responsibility for successful implementation, follow up and review [1].

To further support this initiative, at the United Nations Sustainable Development Summit in 2015, member states formally adopted the 2030 Agenda for Sustainable Development, committing \to providing inclusive and equitable quality education at all levels early childhood, primary, secondary, tertiary, technical

and vocational training"[15]. It's therefore within these global commitments that the current study inscribes itself, with the aim to investigate the contributing role of education for poverty reduction in Burkina Faso.

The question it seeks to answer is: Do households with formally educated heads experience poverty to the same extent as do those headed by uneducated heads in Burkina Faso? Despite the numerous studies mentioned above, no previous study to the best of our knowledge has specially addressed this question for Burkina Faso. We formulate the following hypothesis: H0: All things being equal, there is no significant difference between households with formally educated heads and those with uneducated heads in their experience of poverty in Burkina Faso. In our quest to test this hypothesis, the remaining of the paper is organized as follows: section 2 provides a background on education and poverty in Burkina Faso, section 3 presents the random utility based economic model of spending choices and poverty status, section 4 describes the data and analytical strategy, while section 5 presents the results of the econometric estimation, and section 6 concludes the analysis

Background on Education and Poverty in Burkina Faso

Education, defined as the act of developing a set of knowledge and values, is it moral, physical, intellectual or scientific, is considered to be essential for reaching a desired cultural competency. In this way, education allows for the transmission from one generation to the next, of the culture necessary for personality development and social integration. There are several types of educations; the one that is of interest to us in this study is\ formal education which is a modality of acquiring education and professional training within a scholastic environment. It typically has three levels: primary, secondary, and higher. Poverty on the other hand is typically measured in one of two ways: one approach is monetary, and the other is non-monetary. The measurement of poverty using income or consumption has a long tradition, although consumption is usually the preferred indicator in developing countries. Consumption is typically assumed to be less volatile than income and is thus often seen as a better measure of current living standards. In Burkina Faso, the choice was made since 1994 to use the monetary approach through consumption spending to measure economic well-being, and therefore it will be our chosen measure of poverty in this analysis.

Burkina Faso is a landlocked Sahelian country with an area of 274,200km^2 and an economy based mainly on agriculture, which employs 84% of the population. With over 16 million inhabitants in, the country is characterized by high levels of vulnerability and poverty, in part due to its low access to education and growing population density (3.1%). Despite the many poorest made to increase and improve educational provision, the country still remains one of the poorest and least educated in the world, with a gross enrollment rate of 50.4% [16]. Primary schooling nationally had an average of 66.5%, with major disparities in access to education based on sex and the administrative region where a household lives. In fact the rate of primary schooling is three times higher in urban areas, justified by the fact that heads of households through their proximity and daily interactions with modern institutions have better perception of primary schooling as part of a child's life, than their rural counterparts. In relation to gender, the percentages of boys and girls admitted in the educational system are fairly equal (82.8% for boys, and 83, 2% for girls), but the problem resides in girls retention in the scholastic system since only 3 girls out of 10 nishes with their primary education. This picture of education has however been improving due to educational policies implemented by the government to impact both the demand side and the supply side of education, including "le programme de Developpement Strategiquede l'Education de Base (PDSEB)", "le programme National d' Acceleration de l'Alphabetisation (PRONAA)", "les programmers des Centers d 'Education de Base Non Formula (CEBNF)" [17]. Overall, the state of poverty and education in Burkina Faso suggests a low rate of education and a high rate of poverty in the country. Because educational choices made by households influence their per capita consumption spending which in turn defines household's poverty status, research offering insights, on how education impacts poverty status in Burkina Faso is of relevance. As such, this study offers opportunities to make educational policy recommendations to address household's poverty and improve standards of living in Burkina Faso.

Random Utility Model of Spending Choices and Poverty Status

The premise underlying the modeling strategy implemented in this article lends itself to the discrete choice framework derived under the assumption of utility maximization behavior following the exposition by Cameron & Trivedi [18]. In the random utility formulation it is assumed that a household chooses between two spending alternatives. Spending an amount of income below the poverty line, or spending an amount of income above the poverty line. These two alternatives are indexed respectively with 0 and 1 according to which one provides the highest satisfaction or utility. The discrete outcome variable (Pover Status) then takes the value 1 if alternative 1 has a highest utility and the value 0 if alternative 0 has the highest utility. Additive random utility modeling (ARUM) species the utilities of alternatives 0 and 1 as:

$$U_0 = V_0 + {}_0; \qquad \qquad (1)$$
$$U_1 = V_1 + {}_1;$$

Where V_0 and V_1 are deterministic components of utility, with ${}_0$ and ${}_1$ being the random components of utility. We observe y = 1, if $U_1 > U_0$, that is if alternative 1 has the highest utility of the two. Because of the presence of the random components of utility this is a random event with

$$\Pr [y = 1] = \Pr [U_1 > U_0]$$
$$= \Pr [V_1 + {}_1 > V_0 + {}_0] \qquad \qquad (2)$$

=Pr $[_{0\,1} < V_1\,V_0]$

=F $(V_1\,V_0)$;

Where F (:) is the cumulative distribution function of the error differences $(_{0\,1})$. Giving

$$\Pr[y = 1] = F(X^0) \text{ if } V_1\,V_0 = X^0: \tag{3}$$

The ARUM requires a scale normalization since if $U_1 > U_0$ then $aU_1 > aU_0$. This is usually done by specifying the variance of $(_{0\,1})$. Different specifications for the distributions of the error terms $(_0)$ and $(_1)$ give different F (:) and hence different discrete choice models. The log it model is obtained when $F(X^0) = (X^0)$ that is the type 1 extreme value cumulative distribution function:

$$(_{0\,1}) = e^{(\,0\,1)} = (1 + e^{(\,0\,1)}); 8\,1 < (_{0\,1}) < +1 \tag{4}$$

With its test derivative, the density function given by $^0((_{0\,1})) = e^{(\,0\,1)} = (1 + e^{(\,0\,1)})^2$ symmetric about zero. This function characterizes a random variable with mean zero and variance

$^2 = 3\,1{:}814^2$. The choice probability for the log it model is given by:

$$\Pr[(_{0\,1}) < X^0] = (X^0) \tag{5}$$

The orbit model is obtained when $F(X^0) = (X^0)$, that is the standard normal cumulative distribution function, such that the choice probability is given by:

$$\Pr[(_{0\,1}) < X^0] = (X^0) \tag{6}$$

Individuals are assumed to be rational and to make spending choices on the basis of observable characteristics such as (Education, Age, Gender, Marital status, etc), which make up the X vector in equation 5, and are presented in the next section on Table 1.

Data and Analytical Strategy

The empirical analysis is based upon data from the National Survey on Household Living Conditions (EICVM, 2009) administered by the National Institute for Statistics and demography (INSD) in Burkina Faso. The survey uses a two level stratified random sampling with weights that produce nationally representative estimates for households per capita annual spending, and a wide range of demographic and socioeconomic characteristics for the civilian, non institutionalized population in Burkina Faso. Primary sampling units are selected with probability proportional to their size, and the secondary sampling units or households selected with equal probability within those primary sampling units. The EICVM2009 data was collected during a period of twelve months, and had a total of 14; 520 households surveyed from July 07 2009, to August 26, 2010. Of this total, our analysis included 8; 404 after accounting for variables selection and missing data constraints.

Dependent variable construction

It is assumed that households as rational optimizers maximize their utility from the consumption of goods and services they purchase annually. In this quest to satisfy their needs, households choose to spend yearly on consumption, an amount either greater than the poverty line (in which case the household is considered "non poor") or less than the poverty line (in which case the household is considered "poor"). This suggests that households annual per capita spending is an indicator of household poverty status. With the known poverty line at 130; 375FCFA, and the observed annual per capita household spending y_i, the Binary dependant variable capturing household's poverty status is given by:

Non poor = 18y > 130; 375

Poor = 08y 130; 375

Independent variables

Like any scientific study using evidence from observational data, our interests here centers on a postulated causal influence from the attributes and environment of households to their responses, or per capita annual spending choices. It's assumed that these spending choices reflect household's poverty status as well. So in choosing the variables to be included in the model, the question that needs to be addressed in conjunction with our proposed behavioral model is: what other factors effect households spending choices? Keeping in mind that the primary goal of this empirical analysis is not to and the determinants of households poverty status in Burkina Faso, but to measure the role of education in reducing household poverty, then our primary independent variable is the level of education of the head of household. In order to achieve our study goal hoverer we need to account for the effects of other covariates impacting this relationship such as (Residency status, marital status, Gender, and Age of Head of Households) Table 1 provides definitions and summary statistics for all the independent variables in the analysis.

Results

We rest tested the association between variables using cross tabulations and chi-square tests. Since the chi-square calculation generates only positive values, the test is unilaterally one sided and allows us to check the link between the poverty status dependent variable and the nominal explanatory variables. With our primary interest in the effect of education in reducing household poverty, the null hypothesis is that a household spending choice and thus poverty status is not dependent on the head of household's education level (that is the two variables are independent), versus the alternative that they are dependent. The same test is repeated with the other variables in the model, with the results presented in Table 2. The p-values in the second column of the table are all less than the 5% significance level, suggesting a dependence link between the independent variables and the poverty status dependent variable at a 95% confidence level. The third and four column of Table 2 also present descriptive results from our studied sample. Focusing on the fourth column of the table, the descriptive results show that 41.7% of the households experiencing poverty

in Burkina Faso do not have any formal education, 25.5 % have a primary education, 7.1% a secondary education, and only 1.2% has higher education. Similarly, female headed households represent 31.2% of those experiencing poverty, against 36.4% for male headed households. In relation to marital status, the greatest share of households experiencing poverty in the country is found among households with married heads at 37.5%, followed by those headed by widows at 34.7%, and then by those headed by singles at 10.7%. Finally in relation to residency status, households in rural areas experience relatively more poverty at 44.5%, against 18.6% for those in urban areas.

Econometric results

Given the aim of the analysis, to evaluate the impact of education on household's spending choices and thus poverty status, and in conformity with our presented random utility model of spending choices and poverty status, we've specified and estimated four regression models. Two univariate (un adjusted) regression models (probit and log it), with only education level as explanatory variable, and two multivariate (adjusted) regression models (p orbit and log it) where, in addition to education level, the effects of other household characteristics (age, marital status, and gender of the head of household) are accounted for. These four specifications allow us to test the robustness of the relationship between education and poverty status, to potential misspecification and omitted variable biases problems.

The effect of Education: The unadjusted and adjusted probit and log it results are presented in Table 3 for the direct effects, and Table 4 for the marginal effects and odds ratios. These results allow us to test the above stated hypothesis that \ no significant difference exists between households with formally educated heads and those with uneducated heads in their experience of poverty in Burkina Faso". In light of both probit and log it results we can confidently reject this null hypothesis, and conclude that the evidence is enough to suggest the existence of a significant difference between households with formally educated heads and those with uneducated heads in their experience of poverty. In fact, the results show positive and significant relative effects of education. More specifically, compared to households headed by someone with no education, those headed by someone with a primary, secondary and higher education are more likely to have per capita consumption spending above the poverty line. This higher relative likelihood increases with increasing levels of achieved education, and is validated by all four models in Table 3, showing its robustness to model specification. However looking at the magnitude of the effects in the un-adjusted models, compared to those of the adjusted models we note lower values in the later case. This further suggests that omitting the other relevant covariates biases upward the direct effects of education on household likelihood of coming out of poverty. Moreover, considering the model selection criteria of AIC and BIC, we could see that the adjusted models (probit and log it) with relatively lower values for both criteria describe better the incidence of

household poverty in Burkina. Although the adjusted probit model seems to have slightly lower values of the AIC (9279.1< 9286.1) and the BIC (9377.6 < 9384.6) compared to the adjusted log it.

The resulting marginal effects, and odds ratio in Table 4 confirm the outcome of this hypothesis test. The marginal effects from both probit and log it models in the second column show indeed that households for which the head already has a primary education, a one level increase in the head of household education leads respectively to an increase of 7.7% (for the probit model) and 7.4% (for the log it model), in the household likelihood of coming out of poverty. This increased probability of spending a percapita amount above the poverty line is about 22.4% and 29,1% for households with secondary and higher educated heads respectively in both probit and log it models. The odds ratios for the log it model in the third column of Table 4 suggest that compared to households where the head has no education, those headed by someone with a primary, secondary, and higher education have respectively 1.45 times, 4.13 times, and 18.04 times more chances of spending a per capita amount above the poverty threshold of 130,375 CFA franc in Burkina Faso, and thus of being considered non poor.

The effects of the other control variables: Based on the regression results on Table 3 & 4, all of the covariates except for the marital status of the head of household are statistically significant. In relation to the gender of the head of household, both probit and log it marginal effects in Table 3 suggest that compared to households headed by females, those headed by males have greater likelihood (7.8 %) of having a per-capita spending above the poverty line, and thus of being characterized as non-poor. The odds ratios in (4) confirm this result, and show that male headed households have 1.43 times more chances of coming out of poverty than female headed households. The place of residency of a household is also shown to have a significant effect on the likelihood of the household having a per capita spending above the poverty threshold. The marginal effects for the probit and log it models in Table 3 suggest that compared to households living in rural areas, those in urban areas have greater likelihood (17.1%) of coming out of poverty. The odds ratios in (4) confirm this result and show that urban households are 2.37 times more likely to have a per capita spending above the poverty threshold of 130,375 CFA Franc, compared to households living in rural areas. This result could be explained by the high density provision of social services such as, education, health care, clean water in urban areas compared to rural areas. It could also be explained by poor infrastructure such as roads, markets in rural areas. This comes to reform the evidence on the indicators of social well-being, that living conditions in rural areas are much more challenging than those in urban areas.

Moreover, the numerical variable characterizing the household size seems to affect significantly household poverty status in a non linear fashion. As shown by the log it marginal effects in Table 3, its direct, quadratic and cubic effects are all statistically significant.

However, where as its direct and cubic effects both reduce household likelihood of spending above the poverty threshold by respectively 1.76 and 1.21 for every additional individual added to the household, its quadratic effect on the other hand increases this probability by 1.07 for every additional household member. Finally, and similarly to the household size variable, the age of the head of household seems to also have a non linear effect on household poverty status. As presented by the log it marginal effects in Table 3, its direct, quadratic and cubic effects are all statistically significant. Although the direct and cubic effects both reduce the probability of the household spending above the poverty threshold by respectively 0.42 and 0.32 for every additional year in the head of household age, its quadratic effect on the other hand increases this probability by 0.18 for every additional year of age.

Conclusion

This paper has concerned itself with analyzing the effect of education on households spending choices in Burkina Faso, and the reaction of these spending choices on household's poverty status. In this formulation, a household was considered poor if its annual per-capita spending was less than the poverty threshold of 130,375 CFA Franc in 2009. This study used the National Survey on household Living Conditions (EICVM 2009) with a random utility modeling framework to explain household per capita consumption choices and thus poverty status. The results shed some lights on several key determinants of household's poverty in Burkina Faso, including education, gender, residency status, household size and the age of the head of household. It was shown that, compared to households with uneducated heads, those headed by someone with a primary, secondary, and higher education have respectively 1.45 times, 4.13 times, and 18.04 times more chances of spending a per-capita amount above the poverty threshold of 130,375 CFA franc.

These results are in line with previous studies in other countries, showing that education is an essential tool for chronic poverty reduction [19]. This is because a good level of education not only allows households to come out of poverty, but also prevents them from falling back. The evidence from various aspects of this effect of education, suggest that even if we were to take into account other characteristics of households that could influence annual per capita spending, like household wealth, then education, regardless of its level, reduces chronic poverty. The results also validate the importance of using education as a sustainable strategy for fighting against poverty in Burkina Faso, and supports the term commitment of countries and the global education community to the Education 2030 agenda committing \to providing inclusive and equitable quality education at all levels early childhood, primary, secondary, tertiary, technical and vocational training" [14].

Although contributing to and consistent with the past literature in other countries, this study like any other empirical analysis, presents a couple of limitations worth mentioning:

(i)   It only describes monetary poverty, and does not account for non monetary poverty also.

(ii)   It is based on a cross-sectional data set, and therefore does not characterize poverty dynamics.

Finally the year of collection of the study sample, 2009, is a bit far, where as education and poverty is in quick mutations as evidenced by the 2015 commitments at the World Education Forum. Despite these minor limitations however, the results and recommendations from this study shed important lights on the question of education and poverty, and can help guide the practical implementation of the Education 2030 policy in Burkina Faso (Table 1-4).

Table 1: Summary Description of the Variables used in the Econometric Modeling (Source: the National Survey on Household Living Conditions (EICVM, 2009).

		Mean	SD
Cap Spendg	annual household per-capita spending in FCA Franc	259623	334725.3
Age	the age in years of the head of household	46.05	14.94
		Abs. Freq.	Rel. Freq. (in%)
Poverty Status			
Non Poor	= 1 if household is considered "non-poor"	5404	64.3
Poor	= 1 if household is considered "poor"	3000	35.7
Education Level			
None	= 1 if head of household has no education	6354	75.6
Primary	= 1 if head of household has only a primary education	1155	13.7
Secondary	= 1 if head of household has only a secondary education	729	8.7

Higher	= 1 if head of household has some higher education	166	2
Gender			
Female	= 1 if head of household is Female	1124	13.4
Male	= 1 if head of household is Male	7280	86.6
Marital Status			
Single	= 1 if head of household is single	487	5.8
Married	= 1 if head of household is married	7257	86.4
Widow	= 1 if head of household is a widow	660	7.9
Residency Status			
Rural	= 1 if Household lives in Rural area	5550	66
Urban	= 1 if Household lives in Urban area	2854	34

Table 2: Chi-Squared test of Independence between dependent and independent variables (Source: the National Survey on Household Living Conditions (EICVM, 2009).

Variables	Chi-Squared Statistics df ; P-value	Non-Poor	Poor
Education Level	497.53		
	3 ; <2.2e-16		
None		58.3	41.7
Primary		74.5	25.5
Secondary		92.9	7.1
Higher		98.8	1.2
Gender	11.07		
	1 ; 0.000878		
Female		68.8	31.2
Male		63.6	36.4
Marital Status	143		
	2 ; <2.2e-16		
Single		89.3	10.7
Married		62.5	37.5
Widow		65.3	34.7
Residency Status	551.12		
	1 ; <2.2e-16		
Rural		55.5	44.5
Urban		81.4	18.6

Table 3: Estimates of the Probit and Log it models for Education and Poverty Status.

	Unadjusted Models		Adjusted Models	
	Probit	**Logit**	**Probit**	**Logit**
Intercept	0.209	0.334	1.358	2.363
	(0.016)y	-0.025	-0.151	-0.266
Primary	0.449	0.736	0.226	0.369
	-0.043	-0.072	-0.048	-0.08
Secondary	1.257	2.232	0.79	1.418
	-0.072	-0.146	-0.081	-0.155
Higher	2.047	4.073	1.465	2.893
	-0.271	-0.712	-0.307	-0.717

Male			0.212	0.359
			-0.062	-0.104
Married			0.012	-0.038
			-0.095	-0.172
Widow			-0.129	-0.281
			-0.113	-0.199
Urban			0.506	0.863
			-0.036	-0.062
bs(hhsize)1			-4.966	-8.317
			-0.266	-0.485
bs(hhsize)2			2.753	5.049
			-0.557	-1.144
bs(hhsize)3			-2.72	-5.724
			-0.891	-2.433
bs(hage)1			-1.113	-1.978
			-0.352	-0.601
bs(hage)2			0.542	0.874
			-0.195	-0.324
bs(hage)3			-0.87	-1.512
		17	-0.322	-0.544
AIC	10350.5	103505	9279.1	9286.1
IC	10378.7	10378.7	9377.6	9384.6
Log Likelihood	-5171.3	-5171.3	-4625.5	-4629.1
Num. obs.	8404	8404	8404	8404

y standard deviation of the parameters in parentheses.

Table 4: Marginal Effects and Odds Ratios for the Log it models of Education and Poverty Status.

	Marginal Effects Probit	**Logit**	**Odds Ratios Logit**
Primary	0.077	0.074	1.446
	(0.015)	(0.015)	(0.116)
Secondary	0.224	0.224	4.127
	(0.016)	(0.016)	(0.638)
Higher	0.296	0.291	18.04
	(0.02)	(0.018)	(12.901)
Male	0.078	0.08	1.432
	(0.023)	(0.024)	(0.0149)
Married	0.004	-0.008	0.963
	(0.034)	(0.036)	(0.166)
Widow	-0.047	-0.062	0.756
	(0.042)	(0.046)	(0.15)
Urban	0.171	0.171	2.37
	(0.011)	(0.011)	(0.146)
bs(hhsize)1	-1.760	1.759	0.0002
	(0.096)	(0.101)	(0.0001)
bs(hhsize)2	0.977	1.068	155.9
	(0.217)	(0.241)	(178.39)
bs(hhsize)3	0.966	1.211	0.003
	(0.411)	(0.514)	(0.008)

bs(hage)1	0.394	0.418	0.138
	(0.125)	(0.127)	(0.083)
bs(hage)2	0.192	0.185	2.397
	(0.069)	(0.069)	(0.777)
bs(hage)3	0.308	0.32	0.22
	(0.115)	(0.115)	(0.12)

Is the 0.01% significance level, Is the 1% significance level, Is the 5% significance level y standard deviation of the parameters in parentheses 18.

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