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University Education and Poverty Dynamics Linkages in Nigeria: A State Level Analysis using Logit and Probit Models

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ABSTRACT

Poverty is said to exist when people lacks the means to satisfy their basic needs. Thus, improving the educational attainment of the population is an important requirement to reduce poverty amid the populace and foster development. However, Nigeria with her wealth; she still faces an enormous challenge in her effort to reduce poverty. The aim of this study is to give insight into the factors that affects or influences poverty in-spite of attainment of University education in Nigeria. Percentage data from the thirty-six States of the country including the Federal Capital territory Abuja were explored. Results from the probit and Logit models revealed that of all variable analyzed, only percentage of household heads with poor educational background was significant. This connotes that a state with degree educational level of household heads is 0.2 percent more likely to be poor when compare to non-poor degree educational level of household head.

Keyword: Poverty, university, probit, logit, education.

INTRODUCTION

Education paves the way to empower people to obtain knowledge, have access to jobs and subsequently higher wages. This empowerment allows people to have access to basic health facilities, acquires economic power, etc. This also improves the health condition of the population. An enlightened or educated population is usually crisis free or minimizes. Thus collier, 2007 reported that a country with a higher percentage of its youth in schools

reduces considerably its risk of conflicts. Nigeria with her enormous wealth still faced an enormous challenge in her effort to reduce poverty. It has been estimated that more than seventy percent (70%) of Nigerians are living on less than one US Dollar per day. However, the goal of higher education has long been identified as the process that develop the whole man physically, mentally, morally and technologically to enable him function effectively in any environment in which they find themselves so that they may become more productive, self-fulfilling and attain self-actualization (Tawari, 1986). Hence, the importance of higher education is to provide quality education for her products so that they can assume leadership position in their immediate and external communities (Federal Government of Nigeria, 2004). For a satisfactory completion of a university education, degrees are awarded to worthy graduates.

There are growing numbers of unemployed youths among graduates, particularly at the tertiary level, which is caused in part from the mismatch between educational output and requirements of the labour market. The quality and relevance of education have declined as academic resources, whether faculty or equipment and facilities, have become increasingly in short supply. In addition, teachers/lecturers/workers in the universities and schools going on incessant strikes in support of their protests of either have been underpaid or unpaid for months perhaps years. Pensions are delayed and salaries/wages are frozen for many months and years. This leads to students taking years to graduate. And many who manage to graduate knows little or nothing and practically not fit for the labour market.

As a result, the country (Nigeria) is saddled with more than 20 million unemployed or underemployed youth out of about 167 million people in 2012 (National Bureau of Statistics), a situation that is undermining living standards throughout the country. Under the National Rolling Plan for 2001–2003, the government envisaged growth in employment of 1.8 million jobs—600,000 a year—but that number was still a mere 26% of what is needed just to hold unemployment and underemployment constant among the educated youth. Figure 1 shows the various years at which graduates of tertiary institutions seem to be badly hit by unemployment. This make up about 20 percent of youth unemployment and often remaining unemployed for upward of five years after graduation (NISER, 2013).

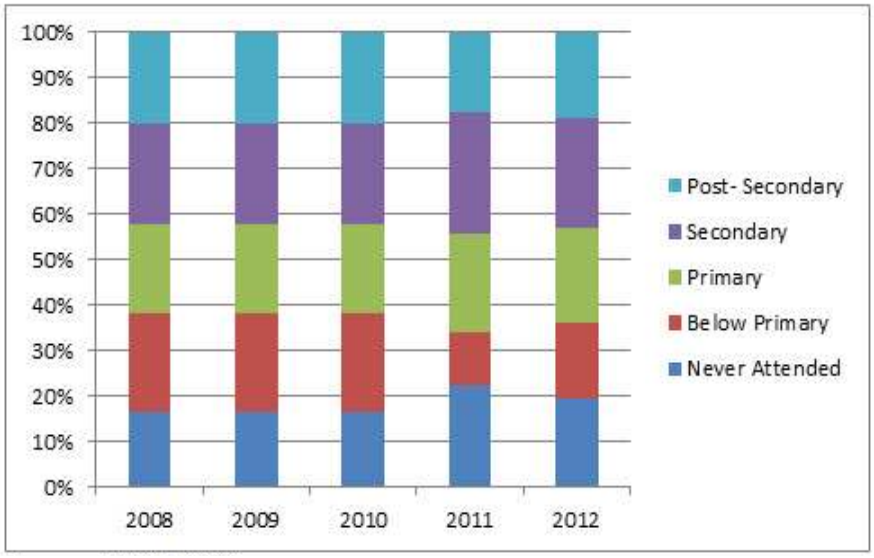

Figure 1: National Youth Unemployment Figures (15-34 years) by Education, 2008-2012 (Source: NISER)

In other to reduce poverty and achieve social and economic development goals, higher education is one of the most powerful means that can rely on. Most people recognize its value for productivity and growth in developed countries, but some people inexplicably consider university education a luxury for developing countries. There is much evidence that the proportion of the population with better education highly correlates with levels of economic development. With this understanding, Oxaal (1997), put the linkages between education and poverty in two ways: (i) investment in education as a poverty reduction strategy can enhance the skills and productivity among poor households; (ii) poverty is a constraint to educational achievement both at the macro-level (poor countries generally have lower levels of enrolment) and the micro-level (children of poor households receive less education). He also asserted that education is a key factor for confronting the multiple challenges of social dislocation, environmental degradation and poverty eradication. Vener (2004), investigates the marginal impact of each individual attribute on the likelihood of a household falling below the indigence poverty line in Paraiba, Brazil, taking into account other characteristics. The study reveals two important and remarkable findings: (i) a conditional correlation between poverty and characteristics of household heads and (ii) information about groups that are particularly vulnerable in 1999. The probability of a household being poor is analyzed based on relevant individual and household characteristics. One of the salient findings is that poverty can be attributed to the lack of income-

generating assets, particularly human capital. In another investigation, Brown and Park (2002) specifically examined the effect of poverty on the educational enrolment and outcomes of children aged 5-16, using a 1997 survey of households and schools from poor countries in six provinces. Their measure of household wealth was expenditure per capita (excluding expenditure on education), and they defined a household to be 'poor and credit' constrained if it is in the bottom third of both expenditure per capita and access to credit. Using a proportional hazard model, they found that children are more likely to drop out of school if the household is poor and credit-constrained (Their most important result), if they have fewer siblings, if the father enrolment decision, and if school fees (possibly proxying school quality) are lower.

The sibling result was interpreted as indicating that siblings are complementary rather than competitors of resources, and the fees improve the quality of education and hence the rate of return. The authors found the test score (for enrolled pupils) to be higher if expenditure per capita is higher (implying that it improves quality) if there are older siblings, and for girl (suggesting that the less able girls drop out of school). However, their variables representing school quality (the pupil-teacher ratio, the proportion of rain-proof classrooms, and proportion of teachers with post-secondary education) had no significant effects on test scores.

There are a total of one hundred and four (104) universities in Nigeria – forty four (44) private, forty-four (44) state, and twenty-six (26) federal universities turning out various graduates. Nigeria's education system turns out more than 3 million secondary and tertiary graduates every year, but it is estimated that the economy can absorb only around 10% of these graduates annually – Nigeria Ministry of Finance, (2000). Table 1 shows the various academic session of graduate output from Nigeria Universities. There has been steady increment in graduate output from Nigeria's universities, a proof shown in Table 1. 2000/2001 to 2004/2005 academic session revealed this much-talk about increment.

However, there has been much debate on whether the attainment of a university education influences the rates of poverty dynamics. If according to Akooje and Mcgrath, 2005, that basic education and poverty has strong positive correlation, then it became logical fact that stronger positive relationship exist between higher education, particularly university education, and poverty reduction. Nigeria is about the 27^{th} poorest country in the world, where more than 60% of its population lives on less than $1 a day (United Nations Economic Commission for Africa, 2002). This shows that the rate of incidence of poverty is extremely high.

Table 1: Bachelor's Degree Graduate Output by Faculties from 2000/2001 – 2004/2005 Sessions.

	2000/2001		2001/2002		2002/2003		2003/2004		2004/2005		
Faculty	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**Total**
Administration	3294	2298	4727	3413	6380	5321	4089	3201	2521	1843	37087
Agriculture	1086	604	1366	705	1366	873	1268	828	299	167	8562
Arts	2732	2351	2938	2982	3672	3963	2706	2746	1687	1495	27272
Education	4129	4117	3221	3248	3560	3391	2361	3008	2352	2095	31482
Eng/Tech	4194	581	4558	679	5425	800	4182	689	1051	116	22275
Envirn. Scs	932	375	1079	395	1201	560	940	368	643	243	6736
Law	1558	990	2112	1781	2846	2664	1901	1461	1007	626	16946
Medicine	1200	568	1538	613	1489	903	1219	721	359	230	8840
Pharm. Scs	242	78	312	138	186	144	320	235	12	10	1677
Sciences	4743	2494	4461	2840	5839	4347	4390	2581	2190	1379	35264
Social Scs	5021	3223	8459	4996	8187	5856	6017	4220	2893	2296	51168
Dentistry	0	0	45	22	67	30	48	21	0	0	233
Vet. Medicine	68	19	99	47	155	54	47	21	30	6	546
Others	583	311	1059	457	879	401	617	214	273	209	5003
Total	29782	18009	35989	22316	41252	29109	30105	20314	15327	10715	252918
Grand Total	**47791**		**58305**		**70361**		**50419**		**26042**		

Source: National Bureau of Statistics Social Statistics in Nigeria (2005:37).

Theoretical and empirical analysis tells that university education is a key to job creation and unemployment is a major cause of poverty. Therefore, countries with higher levels of education achievement have corresponding lower levels of poverty (Dollar & Kraay, 2002). Higher levels of education enrolment in school and hence a resultant higher level of education achievement can be a result of lower parental poverty levels where parents or household have enough income to invest in their children's education (Adetanwa Aina & Olabisi, n.d; Gom, 2008; Rahman, 2006). However, large and fast growing unemployment rate among Nigeria university graduate has become worrisome. Education and poverty has become a major research issues for economist and statistician for few decade now, but unfortunately, very few researcher and few empirical studies exist in Nigeria's perspective. This research aimed to study the factors as well as the probabilities that influence poverty in spite of attainment of university education. Therefore, this study is a "big plus" to the scanty empirical analysis of poverty and attainment of university education in Nigeria context. Other researchers that has done research in education and poverty include; NSO (2012), Dunga 2012 etc.

MATERIALS AND METHODS

The data used in this study was collected from the office of statistics as recorded in the annual statistical bulletin 2012, for the thirty-Six (36) states in Nigeria, including the federal Capital territory FCT. Our main interest specifically is to use and collect states information on percentage of

household size of absolute poverty, percentage of National unemployment rate by state, percentage distribution of persons age 15years and above by marital status, regional location of states, percentage distribution of persons by age group, percentage educational level of house head by absolute poverty etc. A number of different approaches have been used to understand the factors associated with poverty dynamics and poverty transitions. In this study, we aimed to determine whether the attainment of university education affects rate of poverty dynamics in Nigeria. Given the dynamic and dichotomous nature of this study, a qualitative response model is appropriate. This relate to the probability of an event to various explanatory variable. In other to provide a detailed analysis, the discrete probit and logit models are used. The logit and probit models are the most commonly used members of the family of generalized linear model. Response variables in binary logit and probit models have two categories. Been a binary response, we write;

$$P_r(y=1/x) = G(\beta_1 + \beta_2 x_2 + \ldots\ldots\ldots\ldots\ldots + \beta_K x_K) \quad (1)$$

$$P_r(y=1/x) = G(x\beta) \quad (2)$$

Where;

$$x\beta = \beta_1 + \beta_2 x_2 + \ldots\ldots\ldots\ldots + \beta_k x_k$$

Where G is a cumulative density function taking values between zero and one: $0 < G(z) < 1$, for all real numbers z;

$$\left.\begin{array}{l} \text{(a) } P_r(y=1/x) \to 1 \text{ as } x\beta \to \infty \\ \text{(b) } P_r(y=1/x) \to 0 \text{ as } x\beta \to -\infty \end{array}\right\} \quad (3)$$

Where (3)(a) is the probability of household heads from the thirty-six (36) states including the FCT, with university education being poor.

The logit model given as;

$$P_r(y=1|x) = G(x\beta) = \frac{\exp(x\beta)}{1+\exp(x\beta)} = \Lambda(x\beta) \quad (4)$$

In the probit model, G is the standard normal CDF as expressed below,

$$P_r(y=1|x) = G(x\beta) \int_{-\infty}^{x\beta} \phi(z)dz \quad (5)$$

$$\text{Where } \phi(z) = \frac{\exp(-\frac{z^2}{2})}{\sqrt{2\prod}} = \frac{1}{\sqrt{2\prod}} \exp(-\frac{z^2}{2})$$

The probability of observing the entire sample in this study is;

$$L(y \mid x;\beta) = \prod_{i \in l} G(x_i\beta) \prod_{i \in m} [1 - G(x_i\beta)] \qquad (6)$$

Where l refers to observations for which $y = 1$, and m to the observation for which $y = 0$

And the log likelihood for the sample is given as;

$$InL(y \mid x;\beta) = \sum_{i=1}^{N} \{y_i \ln G(x_i\beta) + (1 - y_i) \ln[1 - G(x_i\beta)]\} \qquad (7)$$

Therefore, log likelihood for the logit and probit models respectively as shown in (8) are;

$$\left.\begin{aligned} InL(y \mid x;\beta) &= \sum_{i=1}^{N} \{y_i[x_i\beta - In(1 + \exp(x_i\beta)] - (1 - y_i)In(1 + \exp(x_i\beta))\} \\ InL(y \mid x;\beta) &= \sum_{i=1}^{N} \{y_i In\Phi(x_i\beta) + (1 - y_i)In(1 - \Phi(x_i\beta))\} \end{aligned}\right\} \qquad (8)$$

The logit and probit models stated in (4) and (5) was given by J. Johnston and J. DiNardo (1997).

Response Variable:

$$y = \begin{cases} 1 \text{ if State \% population of household with a university degree is poor (PHUD)} \\ 0 \text{ Elsewhere} \end{cases}$$

Table 2: Description of variable used in the logit and probit analysis.

Explanatory Var.	Type	Description of variables
PHHED	Binary	Educational level of household by States
PUNEM	Continous	National Unemployment rate by States
PRLOS	Binary	Regional location of States
PMMST	Binary	Marital Status by States
PAG29	Continous	Distribution of person by age group of between 15 – 29
PAG64	Continous	Distribution of person by age group of between 60 – 64
PHRHT	Continous	Housing Tenure (Rented apartment)
PINC A	Continous	Household monthly income of N1000
PINC B	Continous	Household monthly income of N10000 – N19999
PINC C	Continous	Household monthly income of N80000 and above
PPMHH	Binary	Male Gender of Household head by States

The logit and probit models gives similar characteristics of the data because the densities are very similar. Both approaches are much preferred to the linear probability model (Chris, B. 2007). However, our point of interest here relates to the probability that y equal one.

RESULTS

The explanatory variable used in the logit and probit model are presented in Table 2. The parameter estimation of household poverty with a university degree as a rate of response variable for logit and probit model is;

$$PHUD_i = \beta_i + \beta_1 PHHED + \beta_2 PUNEM + \beta_3 PRLOS + \ldots\ldots\ldots\ldots + \beta_{11} PPMHH + \varepsilon \quad (9)$$

With the use of RATS version 8.3 – a special software for statistical analysis including limited dependent variable models. The binary logit and probit estimation was done by Newton-Raphson algorithm using the Maximum Likelihood estimation (ML), and convergence achieved after 8 iterations. The probit and logit models were used both to estimate the impact of the explanatory Variables, shown in Table 2 , and to predict probabilities of change in the response variables levels. The ML estimate of β in (9) gives the greatest likelihood of observing the sample, conditional on the explanatory variables x. The probability of observing that a state population of household head with a university degree is poor [$y_i = 1$], is $G(x\beta)$

while the probability of observing $y_i = 0$ is $1 - G(x\beta)$. The Pseuso-R^2 values in predicting the actual observation of y_i for both models (logit and probit) are 0.649 and 0.652 respectively, resulting in the log likelihood values at -7.9737 and -7.9095 approach zero from below- as discuss by Söderborn M. (2011). This shows fitness of the used models. The log likelihood ratio is often used to test whether a sub-set of the explanatory variable can be omitted from the model. The significance of the likelihood ratio test at 0.00879 and 0.00841 respectively also shows the adequacy of the models as shown in Table 3 and Table 4. The following hypothsis were set-up for both logit and probit models;

$$H_0 : \beta_1 = \beta_{11} = 0 \; Vs \; H_1 : \text{the } \beta_{1i} \text{ are not equal to zero} \qquad (10)$$

In equation (10), a p-value for both models at 0.729 and 0.575, with chi-square(11) values of 7.815 and 9.501 respectively for the logit and probit models, showing a complete rejection of the Null hypothensis, that all parameters are equal to one .

Table 3: Estimated binary Logit values for Marginal and Average partial effects.

	Parameter Estimates		Marginal Effects		Average Partial Eff.		
Variables	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error	Signif
Constant	-7.987675	24.448965					0.74388869
PHHED	4.270973	2.197773	0.197698	0.101732	0.276935	0.105551	0.05197773
PUNEM	0.023355	0.112397	0.001081	0.005203	0.001514	0.007255	0.83539566
PRLOS	4.141090	4.244834	0.191686	0.196488	0.268513	0.276256	0.32928262
PMMST	-0.088820	0.186344	-0.004111	0.008626	-0.005759	0.012039	0.63361543
PAG29	-0.062848	0.408489	-0.002909	0.018908	-0.004075	0.026474	0.87772323
PAG64	1.567752	2.014824	0.072569	0.093264	0.101655	0.131099	0.43650491
PINCC	0.393255	0.314607	0.018203	0.014563	0.025499	0.019056	0.21130345
PHRHT	-0.101799	0.183077	-0.004712	0.008474	-0.006601	0.011711	0.57818171
PINCA	0.035037	0.287262	0.001622	0.013297	0.002272	0.018571	0.90292451
PINCB	0.116517	0.238921	0.005393	0.011059	0.007555	0.015334	0.62577596
PPMHH	0.022177	0.122507	0.001027	0.005671	0.001438	0.007960	0.85634525

Log Likelihood	-7.9737
Average Likelihood	0.8061
Pseudo-R^2	0.6497
Log Likelihood(Base)	-20.5272
LR Test of Coefficients(11)	25.1070
Significance Level of LR	0.0087

Chi-Squared(11) = 7.8150 or F(11,*) = 0.7104 with Significance Level 0.7297

As seen and expected in Table 2 & Table 3, all estimated values of logit and probit models for Parameter estimates, Marginal Effects and Average partial

Effects are very close. Where all value of the variables used in this study are in percentages (%). Only the PHHED variable seems significance at 5% level. The marginal effects - the effects on the response probability $P_r(y=1/x)$ resulting from a change in one of the explanatory variables evaluated at the mean shows that a poor household head with university degree is 0.2% more likely than non-poor household heads with university education.

Table 4: Estimated binary probit values for Marginal and Average partial effects.

	Parameter Estimates		Marginal Effects		Average Partial Eff.		
Variables	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error	Signif
Constant	-4.411297	13.051421					0.73536801
PHHED	2.448994	1.203479	0.232969	0.051940	0.286396	0.062663	0.04185806
PUNEM	0.012517	0.055155	0.001191	0.002380	0.001464	0.003589	0.82046172
PRLOS	2.367296	2.371641	0.225197	0.102357	0.276841	0.155724	0.31819812
PMMST	-0.048980	0.107205	-0.004659	0.004627	-0.005728	0.006995	0.64775729
PAG29	-0.036509	0.217644	-0.003473	0.009393	-0.004269	0.014201	0.86678407
PAG64	0.891137	1.036242	0.084773	0.044723	0.104213	0.067968	0.38980576
PINCC	0.226668	0.158756	0.021563	0.006852	0.026507	0.009765	0.15335729
PHRHT	-0.058847	0.102766	-0.005598	0.004435	-0.006882	0.006651	0.56689819
PINCA	0.008185	0.164399	0.000779	0.007095	0.000957	0.010734	0.96029316
PINCB	0.064655	0.129825	0.006151	0.005603	0.007561	0.008428	0.61847289
PPMHH	0.010633	0.068313	0.001012	0.002948	0.001243	0.004469	0.87630753

Log Likelihood	-7.9095
Average Likelihood	0.8075
Pseudo-R^2	0.6529
Log Likelihood(Base)	-20.5272
LR Test of Coefficients(11)	25.2354
Significance Level of LR	0.0084

Chi-Squared(11) = 9.5016 or F(11,*) = 0.8637 with Significance Level 0.5756

DISCUSSION / CONCLUSIONS

This study examined analysis of factors that affects the probability of being poor given the attainment of a university education. Only percentage of household heads with poor educational background was significant at 5% level for all variables analyzed. Results show that a poor household head with university degree is 0.2% more likely than non-poor household heads with university education. This connotes that a state with degree educational level of household heads is 0.2 percent more likely to be poor when compare to non-poor degree educational level of household head. This translates to mean that a poor degree educational level of household heads from state would

more likely translate to poor educational level of state's population. However, as shown in Tables 3 and 4, other analyzed variables, like Region, Marital status, have no influence on the relationship between university education and poverty.

However, in other to reduce effect of poverty on educated households, it is recommended that various states government should provide graduates with the training and support necessary to help them establish a career in small and medium size business. These skills training will make them meet the manpower needs of society. Students who would have contributed immensely towards the development of the country are found studying programmes in which they do not have the requisite requirements and knowledge. This is a case of fixing square pegs into round holes and this has contributed into a high number of unemployed graduates who are taking time to identify where exactly they can fit in among the various sectors of the economy. Therefore, academic institutions at all levels including tertiary institutions should ensure that students who have no bases being in school should be advised to withdraw and re-directed to other areas or trade like Vocational and technical training.

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