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The rich or the poor: who gains from public education spending in Ghana?

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Abstract

Purpose – The purpose of this paper is to examine the incidence of public education subsidies in Ghana. Since the late 1990s, Ghana's government has increasingly recognized human capital as key to alleviating poverty and income inequality, causing dramatic increases of government expenditures to the education sector. At the same time user fees have been introduced in higher education while basic education is being made progressively free. The question then is, whether these spending increases have been effective in reaching the poor and to what extent? What factors influence the poor's participation in the public school system?

Design/methodology/approach – The authors address the key issues by employing both the standard benefit incidence methods and the willingness-to-pay method.

Findings – The results give a clear evidence of progressivity with consistent ordering: pre-schooling and primary schooling are the most progressive, followed by secondary, and then tertiary. Own price and income elasticities are higher for private schools than public schools and for secondary than basic schools.

Practical implications – Given the liquidity constraints African governments face yet there is the need to improve the human capacity of the countries, this study offers solution to how to optimally allocate the educational budget.

Originality/value – The use of policy simulations to ascertain the incidence of public spending on education is innovative as far as previous studies in Africa is concerned.

Keywords Development, Efficiency, Education

Paper type Research paper

1. Introduction

Human capital development is widely recognized as an important requirement for achieving sustained economic growth and rising incomes, particularly in developing countries (World Bank, 1995). Its role was critical in the outstanding economic transformation of Japan, Taiwan, Hong Kong, South Korea, and other fast-growing economies (Becker, 1995). Empirical evidence suggests that each additional year of schooling is associated with a 6-10 per cent increase in earnings in developing countries (Duflo, 2001), providing further support for educational investment as an effective approach to poverty reduction both by encouraging economic growth and as a method of redistribution to the poor (Besley and Burgess, 2003).

JEL Classification — H22, H52, H53

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In Ghana, the government has identified investments in human capital (education and health) as an important means of achieving broad-based growth resulting in effective poverty reduction (Government of Ghana (GOG), 2005; Canagarajah and Ye, 2001). In line with this, public education expenditures have increased consistently, reaching about 20 per cent of total expenditures (about 5.0 per cent of GDP) and 74.0 per cent of social spending in 2005 (Osei *et al.*, 2007, p. 10)[1]. The question is, how are public education subsidies benefiting poorer households in Ghana? Demery *et al.* (1995) conducted benefit incidence analysis (BIA) in Ghana using the Ghana Living Standard Survey and found that, the richest quintile receives the largest share of the benefits of public education subsidies compared to the poorest quintile. Nearly 20 years later, the question is, whether the distributional pattern of education benefits has changed? Have the recent pending increases improved access to, and choice of public schools by poorer households? Who then are the actual beneficiaries of subsidized education services? And what factors determine the choice of education services?

The purpose of this study is to examine distribution, coverage, utilization as well as the benefit incidence of public education spending in Ghana, considering all levels of education - pre-schooling, primary, secondary, and tertiary. We address thee above questions using a combination of BIA and willingness-to-pay approach to analyze the welfare impact of public education expenditures[2]. We use a nested multinomial logit (NMNL) model to estimate the demand for education services and then use the compensating variations (CVs) derived from those estimates to value education services to households. The demand estimates also enable us to examine the factors influencing households' utilization of these services and to conduct some policy simulations. We also compare the results from the static analysis to those of Demery *et al.* (1995) to see how the distribution of the education benefits has changed overtime.

The remainder of the paper proceeds as follows: Section 2 provides a brief overview of the education sector in Ghana. The review of previous research is considered in Section 3 while Section 4 explains the methodology and data. The results and discussions are presented in Section 5 while Section 6 presents the concluding remarks.

2. A brief overview of the education system

Ghana's education system was established to reflect a standard British-style education. This system was once regarded as one of the most developed in West Africa (Demery *et al.*, 1995). The general economic decline of the early 1980s severely affected the education system and by the mid-1980s, the system was already in sharp decline. The education budget as a share of GNP had declined by 5.0 percentage points between 1975 and 1983 (6.4-1.4 per cent) with primary education spending per capita falling by 61 per cent over the same period (Demery *et al.*, 1995). Besides budgetary issues, the education system also suffered from acute shortage of educational materials including teachers, textbooks, and instructional materials throughout the country's schools (Akyeampong *et al.*, 2007). The problem was exacerbated by poor conditions of service (low salaries) which caused the exodus of trained teachers for greener pastures elsewhere, particularly to Nigeria, where the oil boom has increased the demand for professionals including teachers.

Against this background, a radical educational reform was launched in 1987 as part of the overall economic reform programme (ERP), which sought, among others, to expand and create a more equitable access at all levels of education; to change the structure of the school system, reducing the length of pre-tertiary education from 17 to 12 years while increasing contact hours between teachers and pupils[3]. The deteriorations

that characterized the sector in the 1970s were halted while the infrastructure base was improved. The number of basic schools also witnessed a significant increase – rising from 12,997 in 1980 to 18,374 in 2000 – while attendance and completion rates improved (Akyeampong *et al.*, 2007). Total government expenditure on education had more than doubled under the ERP, moving from 1.4 per cent of GDP in 1983 to 3.8 per cent in 1992 (Demery *et al.*, 1995). Total education expenditures (actual) both as a share of the national discretionary budget and GDP have also increased consistently reaching 31.0 and 6.0 per cent, respectively, in 2006 (Ministry of Education Science and Sports (MOESS), 2008); the lion's share going to basic education.

Financing education has remained central in Ghana's education policy[4]. Rate of return studies have shown that in Sub-Saharan Africa, both the social and private rate of return are highest in primary education and lowest in higher education (Psacharopoulos, 1994; World Bank, 1995). At the same time, benefit incidence studies have shown that public expenditures on primary education are welfare improving compared to those on higher education. The implication of these findings is straight forward: cut subsidies to higher education and introduce cost recovery through user fees, raise subsidies to basic education and abolish tuition fees. In the mid-1990s and consistent with the above policy implications, Ghana's education system witnessed two main policy reforms: cost recovery measures were introduced in higher education to be achieved through increased school fees, facilities user fees, and withdrawal of subsidies while "free and compulsory universal basic education" (FCUBE) was introduced in basic education (to be achieved by 2005).

The cost recovery measure was initially opposed by tertiary education students with demonstrations and disruption of academic calendars, forcing fees to remain consistently low with little upward adjustments. The new policy is to allow qualified applicants who do not get a place in the regular admission but can afford the full fees to enrol. The FCUBE initially covered only the tuition fee. However, the cost of sending a child to school goes far beyond tuition. Other costs such as cost of uniform, books, travel, tariffs for structural works, parent' teacher association fees – used as supplements to the government subsidies to the schools (Canagarajah and Ye, 2001) – all impose substantial burden on households (Aryeetey and Goldstein, 2000). The programme led to steady but slower increase in school enrolments, yet failed to reduce the opportunity cost of schooling to households (Akyeampong, 2009). In order to make the FCUBE fully operational, the government, in 2005, initiated the capitation grant concept, abolishing fees being charged in basic schools by providing each school with a little grant for each child enroled[5]. The school lunch and the free uniform programmes have also been launched.

The recent proliferation of private universities also marked a significant feature of the reforms. These institutions, mainly religious based, offer a limited number of professional courses – accountancy, marketing, economics, banking and finance, and computer science – tailored towards the labour market. They target mainly working class students and run programmes in the evenings and on part-time bases, employing mostly part-time teachers. They derived revenue from tuition and boarding fees (Larocque, 2001). The traditional universities have come under constant attacks from employers in recent years for failing to produce graduates that meet the changing labour market standards. Thus, the emergence of the private institutions should be seen as a welcome development since they are more focused on the job market requirements than just providing a general education.

3. Public spending, education, and poverty

The impact of public spending on educational outcome has been a major subject of research for years, with mixed results. The general consensus is that public spending

alone is insufficient for achieving improved educational outcomes of the poor. The issue of targeting is equally important (Martinez-Vazquez, 2001). Meanwhile, Yuki (2003) has compiled studies that examined the incidence of public spending on education in a cross-section of developing countries. For those that focus on Africa, the poorest quintile shares in total education subsidies were 16.4 per cent in Ghana in 1992 (21.8 per cent primary, 14.9 per cent secondary, 6.0 per cent tertiary), 19.9 per cent in South Africa in 1993 (25.8 per cent primary, 18.8 per cent secondary, 6.1 per cent higher), 19.4 per cent in Cote d'Ivoire in 1995 (28.8 per cent primary, 11.2 per cent secondary), 17.0 per cent in Kenya in 1992 (21.8 per cent primary, 6.4 per cent secondary, 2.0 per cent higher), 16.0 per cent in Malawi in 1995 (20.0 per cent primary, 9.0 per cent secondary, 1.0 per cent higher), 13.0 per cent in Tanzania in 1994 (20.0 per cent primary, 7.6 per cent secondary, 0.0 per cent higher), and 8.3 per cent in Madagascar in 1994 (17.2 per cent primary, 2.0 per cent secondary, 0.0 per cent higher). In all these countries, the poor gains a disproportionately higher proportion of primary schools subsidies while subsidies to higher education accrue mainly to the wealthy.

More specific evidence can be found in Glick and Razakamanantsoa (2006) who find in Madagascar that primary and secondary education are more equally distributed than consumption expenditures. University enrolments are, however, concentrated among the wealthy than consumption. Primary schooling was found to be per capita progressive while secondary and university schooling were found to be per capita regressive – they accrue disproportionately to the well off. Younger (1999) also uses a combination of benefit incidence and behavioural approaches to assess the relative progressivity of public services in Ecuador in 1994 and finds that primary education is the most progressive, followed by secondary education, public universities, and then private universities. He actually compared three different versions of the benefit incidence method: standard (with unit cost which varies by region), uniform (binary indicator: one if a service is used and zero otherwise), and CV based and concludes that the three methods yield similar results in terms of the ranking of public services with consistent ordering.

In a related study in Peru in 1998, Younger (2000) finds that, spending on primary education is the most progressive, followed by secondary schooling, then post-secondary. He also observed that though social spending is likely to have an equalizing re-distributional effect, its overall impact on poverty was only marginal. Glick and Sahn (2006) find in Madagascar that fee increases reduce public and total (public plus private) primary enrolment proportionately much more for the poor than the well-off, making the distribution of schooling less equitable. They also find that improvement in public school quality tends to benefit the poor disproportionately.

4. Method of analysis

In this section, we derive a school choice model that enables us to understand behavioural responses to public spending. Following previous authors (Gertler and Glewwe, 1990; Younger, 1999; Glick and Sahn, 2001), we assume that households derive utility from the human capital of children, which depends on schooling and on the consumption of all other goods (net income). Confronted with the decision to enrol in public school, private school, and non-enrolment, parents choose the option that yields the highest utility. Schooling raises the human capital, a kind of asset to parents which is achieved at the cost of school fees and reduced consumption of other goods. An individual will only choose the non-enrolment/no-school option only if it yields utility higher than all other alternatives. For each option (say option *j*), the

indirect utility associated with choosing that option depends on the following simple linear specification:

$$V_{ij} = c\left(Y_i - P_{ij}\right) + \beta_1 S_{ij} + e_{ij} \tag{1}$$

where $c(Y-P_j)$ is net household income (proxied by household expenditure, Y) less school cost at option j (P_{ij}), which includes both the direct and the indirect (opportunity) costs. Finally, e_j is a noise term specific to the household and unobserved by the researcher, which can be correlated across options within a branch. The function S_{ij}, which represents the increase in human capital, is expected to vary across options since the quality of the alternatives may differ. For the non-enrolment option, S_{ij} is normalized to zero based on the assumption that the individual gains no utility from not attending school. Since the change cannot be directly observed, $\beta_1 S_{ij}$ is replaced by a reduced form equation for the utility from human capital as follows:

$$\beta_1 S_{ij} = YQ_j + \delta_j X_i + n_{ij} \tag{2}$$

where Q_j is a vector of school quality variables and X_i is a vector of observed household and individual characteristics. This is what Glick and Sahn (2001) referred to as representing a production function of human capital in which both school and household variables are inputs. Substituting (3.4) into (3.3) yields:

$$V_{ij} = c\left(Y_i - P_{ij}\right) + YQ_j + \delta_j X_i + \varepsilon_{ij} \tag{3}$$

where $\varepsilon_{ij} = e_{ij} + n_{ij}$ and δ_j, the coefficient on household and individual characteristics are allowed to be constant across alternatives. We assume the function, S_{ij} to be linear while net income is assumed to be logarithmic – i.e. $c\left(Y_i - P_{ij}\right) = a\log\left(Y_i - P_{ij}\right)$[6].

The specification used in this study is a NMNL model with three options for school choice considered – no-school/non-enrolment, public, or private. The NMNL model allows us to relax the homoscedasticity (independence of irrelevant alternatives (IIA)) assumption of a potential conditional logit model[7]. In this framework, since the decision to choose a particular provider is a discrete choice problem, the determination of demand involves estimating the probability that a particular service provider – public or private – will be chosen.

In this model, two of the options are in one nest while the other option (with utility normalized to zero) is in the second nest. Thus, the probability that a person chooses option j is given as:

$$\pi_j = \frac{\exp\left(V_j/\sigma\right)\left(\sum_k \exp\left(V_k/\sigma\right)\right)^{\sigma-1}}{1+\left(\sum_k \exp\left(V_k/\sigma\right)\right)^{\sigma}}, \quad k = j, i \tag{4}$$

For the options not chosen, because we do not have figures for direct costs and travel time, we estimate them using the median observed cost for the child's region, area (rural/urban), and type of school (public/private). The use of median scores is to avoid the extreme values bias often associated with mean scores. For the no-school option, the net income is just the gross income. The national survey does not contain quality information; hence the S_{ij} is simply a function of household and individual characteristics plus an option-specific dummy. By leaving out important quality variables that probably correlate with net income and with the probability of choosing a particular provider could

mean that we are overestimating elasticity estimates which could tend to underestimate the incidence of the education services (Younger, 1999). However, in Younger (1999) this omitted variable does not affect the progressivity of services.

4.1 Data and variables

The data for this study are drawn from the latest round of the Ghana Living Standards Survey (GLSS5 2005/06). GLSS5 includes a sample of 8,687 households containing 37,128 household members. The survey collected information on individual and households, as well as information on current education level and type of school, employment, income, and consumption. Our sample includes all children who are attending school or who are "eligible" to attend school. The latter group includes all children of the appropriate age who have not yet graduated from the level of school under consideration. Public education expenditures as well as unit costs incurred at each education level were obtained from the Ministry of Education Science and Sports (MOESS).

We considered three samples for our demand function estimations: pre-school, primary, and secondary. We did not include tertiary education in the demand function estimates for two reasons: rationing of tertiary education and the share of the private sector was too small[8]. Our sample includes all children who are attending school or who are "eligible" to attend school. The latter group includes all children of the appropriate age who have not yet graduated from the level of school under consideration. We follow the standard practice and include all children of an appropriate age who have already graduated from the previous level (at least three for pre-school, at least six for primary, at least 15 for secondary, at least 18 for tertiary). In order to account for late entry and overage attendance – a typical phenomenon in Ghana – we truncate the sample at a maximum age (eight for pre-school, 14 for primary, and 21 for secondary)[9]. Given that those who have already graduated from the current level do not have demand for that level, we omit children of an appropriate age who have already graduated this level. Each model includes similar regressors of age, gender, relationship with head of household, net income, years completed at the current level, head's education and age, a dummy of household composition (number of men, number of women, number of children) while controlling for religion, area of residence, and sector of employment.

As we noted, the cost of schooling (P_j) includes both the direct and the indirect (opportunity) cost. The GLSS5 survey defines the direct cost as the sum of registration and tuition fee, cost of uniforms, cost of books, transport cost, parent teacher association dues, feeding and boarding, and expenses on extra classes. Opportunity cost measures the cost of the time needed to stay in school (Younger, 1999), and it is calculated for children aged ten or older as the time spent at school (six hours) plus travel time multiplied by a predicted wage estimated from a simple OLS wage function. For children below this age, we assume a zero opportunity cost. Net household expenditure differs from gross expenditure by the total school cost, as shown in Table I. The indirect cost (opportunity cost) constitutes the lion's share of total cost, representing 55 per cent of total school cost in both primary and secondary samples. These costs are slightly higher for private providers than the public provider.

The means of net income and their standard deviations were ¢17.9 and ¢15.9 million, respectively, for the pre-school sample, 20.1 and 19.7 for the primary sample, 23.4 and 26.4, respectively, for secondary sample (Table I). These figures also vary across options. For instance, within the pre-school sample, mean net income is 14.7 for the no-school option, 18.1 for the public school option, and 28.1 for the private school option. The mean

Variable	Pre-school Mean	Pre-school SD	Primary Mean	Primary SD	Secondary Mean	Secondary SD
Age of child	4.88	1.53	9.51	2.50	18.11	1.86
Gender (female = 1)	0.49	0.50	0.48	0.50	0.52	0.50
Child of household head	0.81	0.39	0.77	0.42	0.67	0.47
Years completed	0.00	0.00	3.73	1.89	1.97	0.74
Household head's years	6.44	7.65	7.23	8.28	8.42	9.07
Household head's age	44.16	13.06	47.55	12.74	48.26	14.20
Gender of head (female = 1)	0.19	0.39	0.22	0.42	0.25	0.43
Number of men	1.23	0.98	1.30	1.05	1.80	1.26
Number of women	1.56	0.99	1.63	1.08	2.03	1.26
Number of children	3.96	2.26	3.95	2.26	2.66	2.33
Head works in formal sector	0.08	0.27	0.10	0.29	0.15	0.36
Head works in informal sector	0.84	0.36	0.82	0.38	0.78	0.41
Catholic	0.15	0.36	0.16	0.37	0.17	0.38
Moslem	0.21	0.41	0.20	0.40	0.20	0.40
Traditional religion	0.11	0.32	0.10	0.30	0.09	0.28
Resides in Accra (GAMA)	0.05	0.22	0.06	0.24	0.11	0.32
Resides in other urban	0.20	0.40	0.23	0.42	0.29	0.45
Resides in rural coastal	0.08	0.27	0.09	0.29	0.06	0.24
Resides in rural forest	0.27	0.44	0.26	0.44	0.20	0.40
Resides in rural Savannah	0.41	0.49	0.35	0.48	0.34	0.47
Net income (GH¢ "000")	1.79	1.59	2.01	1.20	2.34	2.64
Travel time (hrs)	4.35	3.12	4.37	3.15	4.30	3.05

Source: Author's own estimation based on GLSS5 surveys

Table I.
Descriptive statistics of regressors

ages for the various samples are 4.9 for pre-school, 9.5 for primary, and 18.1 for secondary. Females constitute more than 48.0 per cent of each sample. Majority of households (over 70.0 per cent) dwell in rural areas with over 20 per cent headed by women (Table I).

5. Results and discussion

5.1 Demand for schooling in Ghana

Table II presents estimates of the NMNL model of school choice for pre-school, primary, and secondary schooling. For each model, the Wald tests reject the null of all coefficients being zero and the null of equality of coefficients across the public and private options. Due to the nature of our nested structure, we have to constrain the no-school option to unity; hence its dissimilarity parameter is one. From Table II, the dissimilarity parameters, σ (0.88 for pre-primary, 0.26 for primary, and 0.24 for secondary) are between zero and one, indicating that our model is consistent with the additive random utility maximization. The LR tests, τ rejects the IIA assumption and give strong support for the NMNL instead of a MNL model. The coefficient for net income, the variable of interest is positive, and significant in all equations. As for the child's characteristics, we find that age increases the probability of enroling in both pre-school and primary school (both public and private) but turns negative for secondary.

Being the child of the household's head positively and significant increases the probability of enrolments, both public and private. Despites the slight gender difference in school attendance reported earlier, the gender indicator (= 1 if female) is not statistically significant at any conventional significant levels, except in the secondary equation where females have a lower probability of enrolment. The number of years

Variables	Pre-school		Primary		Secondary	
	Private	Public	Private	Public	Private	Public
Constant	2.61**	1.30	19.25***	19.15***	−7.73**	−7.87***
	(1.28)	(1.22)	(2.59)	(2.55)	(3.01)	(3.01)
Age	0.42***	0.48***	0.95***	0.91***	−0.76***	−0.76***
	(0.04)	(0.03)	(0.09)	(0.09)	(0.12)	(0.12)
Child of head	0.08	0.14	0.58***	0.51***	0.36***	0.35***
	(0.17)	(0.12)	(0.11)	(0.11)	(0.12)	(0.12)
Gender (female = 1)	0.10	0.12	0.03	0.01	−0.42***	−0.43***
	(0.11)	(0.08)	(0.09)	(0.08)	(0.12)	(0.12)
Years completed			0.27***	0.32***	1.75***	1.77***
			(0.09)	(0.09)	(0.14)	(0.14)
Head years of school	0.07***	0.08***	0.06***	0.06***	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Head's age	−0.01	0.01*	−0.00	0.00	0.01	0.01
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Head (female = 1)	0.60***	0.81***	0.59***	0.59***	−0.01	−0.00
	(0.16)	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)
Number of men	−0.22***	−0.06	−0.07	−0.06	0.02	0.02
	(0.07)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Number of women	−0.18**	−0.04	0.05	0.05	0.06	0.06
	(0.07)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Number of children	−0.26***	−0.02	−0.01	0.02	0.04	0.03
	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Head, informal (= 1)	−0.19	−0.18	−0.22	−0.20	−0.47***	−0.47***
	(0.06)	(0.04)	(0.19)	(0.19)	(0.17)	(0.17)
Traditional religion	−3.70**	−0.98***	−0.70***	−0.59***	−12.20***	0.49
	(1.67)	(0.18)	(0.16)	(0.14)	(3.40)	(0.46)
Accra	3.82***	1.23***	0.93***	0.55**	−0.87***	−0.92***
	(0.30)	(0.31)	(0.35)	(0.28)	(0.22)	(0.22)
Rural coastal area	1.55***	0.59***	0.28	0.29*	−0.67***	−0.67***
	(0.26)	(0.16)	(0.18)	(0.17)	(0.23)	(0.23)
Rural forest area	1.58***	0.91***	1.07***	1.06***	−0.69***	−0.72***
	(0.22)	(0.12)	(0.14)	(0.14)	(0.19)	(0.19)
Rural Savannah area	1.71***	0.83***	1.01***	1.04***	−0.58***	−0.77***
	(0.31)	(0.17)	(0.17)	(0.18)	(0.21)	(0.21)
Log (net expenditure)	5.50***	5.50***	3.94***	3.94***	3.24***	3.24***
	(1.56)	(1.56)	(1.35)	(1.35)	(1.26)	(1.26)
σ	0.88***	0.88***	0.26***	0.26***	0.24***	0.24***
	(0.24)	(0.24)	(0.09)	(0.09)	(0.02)	(0.02)
τ	15.28***	15.28***	52.48***	52.48***	7.06***	7.06***
Loglikelihood	−3,062.69	−3,062.69	−4,628.60	−4,628.60	−1,666.99	−1,666.99
% correctly predicted	75.2	75.2	86.7	86.7	79.3	79.3
Observations	4,047	4,047	8,234	8,234	2,632	2,632

Notes: Base choice is non-enrollment. For area of residence, the base category is other urban. The base for religion is other religions. SEs in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Source: Own calculations based on GLSS 2005/2006

Table II.
Nested multinomial logit estimates for choice of schooling

previously completed at the current level has a positive and significant effect on the probability of enrolment at all levels[10]. Years of schooling of the household's head positively and significantly increases the probability of a child's school attendance both across samples and equations, with the exception of the secondary model, as shown in Table II.

The age of the household head is not significant at all conventional significant levels, with the exception of the public pre-school equation. A female headed household has a higher probability of enrolment in all models, exception secondary. Number of men, number of women, and number of children negatively and significantly decrease the probability of private pre-school enrolments at 1.0 per cent significant level. They are insignificant in both primary and secondary equations. We also controlled for regional and religious differences, as well as the sector of employment of the head of the household; only significant variables are reported (Table II).

5.2 The elasticity of demand

The coefficients of the NMNL estimates can be difficult to interpret, thus we explore the influence of price and income variables by the analysis of elasticities. If we let P_j to represent the price for provider j, which by assumption only enters utility of option j (V_j), then it follows that:

$$\frac{\partial \pi_j}{\partial p_j} = \pi_j \frac{\partial V_j}{\partial p_j} \frac{1}{\sigma} \left[1 + \frac{(\sigma - 1)\exp(V_j/\sigma)}{\sum_i \exp(V_i/\sigma)} - \frac{\sigma \exp(V_i/\sigma)\left(\sum_k \exp(V_k/\sigma)\right)^{\sigma-1}}{1 + \left(\sum_k \exp(V_k/\sigma)\right)^{\sigma}} \right], k = j, i \quad (5)$$

Hence, the own elasticity:

$$\varepsilon_{jj} = \frac{\partial V_j}{\partial p_j} \frac{p_j}{\sigma} \left[1 - \sigma \pi_j + \frac{(\sigma - 1)\exp(V_j/\sigma)}{\sum_k \exp(V_k/\sigma)} \right] \quad (6)$$

Note that this equals the standard formula for multinomial logit when sigma is 1. Note also that $\left(\frac{\partial V_j}{\partial p_j}\right) = -\frac{\alpha}{y - p_j} = -\frac{a}{\text{Net expenditure}_j}$ where α is the coefficient on net household expenditure.

Table III reports price and income elasticities of demand calculated at mean levels for each schooling option by expenditure quintile. As would be expected, the price elasticities are consistently negative in all equations and options. For all income quintiles, the elasticities are significantly higher (in absolute terms) for private providers than the public provider. Demand for schooling becomes more elastic

	Own price elasticity			Income elasticity		
	Pre-school	Primary	Secondary	Pre-school	Primary	Secondary
Private						
Poorest quintile	−0.043	−1.551	−4.149	0.048	0.124	0.125
2	−0.022	−0.542	−1.345	0.035	0.089	0.101
3	−0.016	−0.378	−0.917	0.031	0.076	0.093
4	−0.012	−0.301	−0.646	0.028	0.065	0.086
Richest quintile	−0.009	−0.192	−0.393	0.024	0.048	0.082
Public						
Poorest quintile	0.033	−0.147	−0.850	0.012	0.521	0.005
2	−0.008	−0.096	−0.369	0.010	0.041	0.048
3	−0.011	−0.123	−0.491	0.011	0.043	0.050
4	−0.008	−0.131	−0.443	0.013	0.048	0.048
Richest quintile	−0.007	−0.124	−0.433	0.015	0.057	0.051

Source: Own estimations

Table III.
Price and income elasticity of education demand

as one move from primary to secondary. For instance, a 1.0 per cent increase in direct cost of schooling (including tuition, textbooks and supplies) would result in a reduction in demand for public pre-schools by 0.033 per cent among the poorest quintile as compared to 0.043 per cent in private pre-school, other factors being constant. A similar pattern is observed for primary and secondary schooling, though with higher elasticities, as shown in Table III.

All income elasticities also have the expected positive sign, with the lower income groups exhibiting higher price and income elasticities. That is, demand for schooling among the lowest income individuals is substantially more price and income elastic than among the richest group. This suggests that income, proxied by household expenditure is a crucial determinant of school enrolment and school choice. A one per cent increase in income would lead to about 0.125 percentage point increase in the demand for private secondary schools as compared with 0.05 percentage point increase in public secondary schools among the poorest income group (Table III).

5.3 Policy simulation

We complement the above elasticities of demand by carrying out a number of policy simulations. Making education, especially public education more accessible to the people may involve one or more of the following: making public schools free, offering subsidies that make private schools free, and increasing the income of poorer households. We do not have information to calculate the relative cost of these policies but at least we can simulate the impact of each in a simple way. The procedure followed here is, first, we set public provider's price to zero and simulate the change in predicted probability on both the three options (no-school, private and public). Second, we set private providers' price to zero. Third, we increase the income of the poorest households (details below) and simulate its effect on predicted probability. These predicted probabilities are then compared with the predicted probabilities for our baseline model.

Table IV reports the results of the simulations for the three samples (pre-school, primary, and secondary, respectively). From the baseline model (when all variables are at their actual values), we find that, 32.2 per cent of the pre-school sample, 62.5 per cent of the primary sample, and 21.4 per cent of the secondary sample will choose public school. A larger proportion, however, (48.2, 19.8, and 74.6 per cent, respectively) will stay out of school as shown in Table IV. When we set the public provider's price to zero, we find that, the probability of attending public schools rose to 51.5, 73.1, and 26.5 per cent for pre-school, primary, and secondary schools, respectively, while the probability of choosing the private option declines significantly, indicating a substitution into public option. Making private provider's price equal to zero also resulted in a massive substitution into private schooling but compared to the first simulation has a smaller impact on the probability of not attending a school. The fact that non-enrolment is still high even after setting prices to zero is a reflection of the negative effect of high opportunity costs on schooling demand. Akyeampong (2009) highlighted the inability of the FCUBE to reduce the indirect cost of schooling as a major issue with the programme.

In our next simulation, we move all households in the poorest quintile into the second quintile, and then move all poor households to the upper poverty line set by the Ghana Statistical Service (GSS, 2007). We find no drastic change in probabilities. The marginal changes in the probabilities due to changes in income of the poorest households are, however, consistent with the low income elasticities (not reported). This could be suggesting that merely moving households to the poverty line is not particularly effective

	Predicted probabilities			Change in probabilities		
	Pre-school	Primary	Senior	Pre-school	Primary	Senior
Baseline probabilities						
None	0.4816	0.1983	0.7459	0.0	0.0	0.0
Private	0.1801	0.1773	0.043	0.0	0.0	0.0
Public	0.3383	0.6245	0.2135	0.0	0.0	0.0
Price of public option is zero						
None	0.3663	0.1694	0.7065	−0.1153	−0.0289	−0.0394
Private	0.1184	0.0794	0.0088	−0.0617	−0.0979	−0.0342
Public	0.5153	0.7511	0.2848	0.1770	0.1266	0.0713
Price of private option is zero						
None	0.3864	0.1721	0.7142	−0.0952	−0.0262	−0.0317
Private	0.4345	0.49	0.1352	0.2544	0.3127	0.0922
Public	0.1791	0.3378	0.1505	−0.1592	−0.2867	−0.063
Moving everybody out of poorest quintile						
None	0.481	0.1975	0.741	−0.0006	−0.0008	−0.0049
Private	0.1964	0.1778	0.0452	0.0163	0.0005	0.0022
Public	0.3226	0.6247	0.2137	−0.0157	0.0002	0.0002
Moving poor households to the poverty line						
None	0.4814	0.1977	0.7390	−0.0002	−0.0006	−0.0069
Private	0.1956	0.1777	0.0470	0.0155	0.0004	0.0040
Public	0.323	0.6246	0.2140	−0.0153	0.0001	0.0005

Source: Own estimation based on Table II

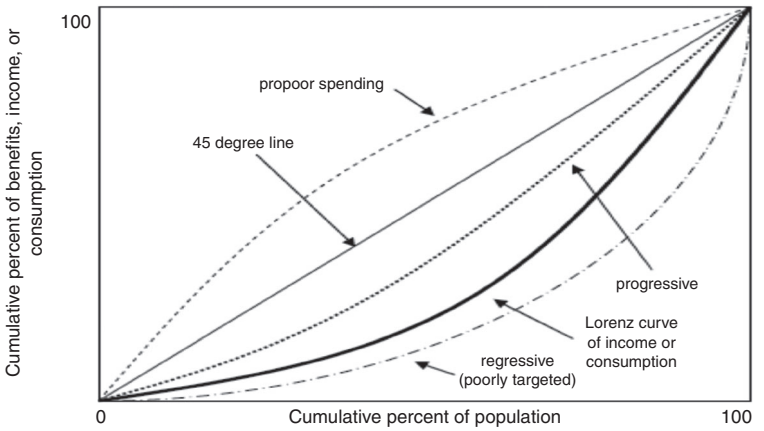
Table IV. Simulated probabilities by expenditure quintiles, and type of provider

in increasing attendance; income must be raised well above the poverty line in order to make significant impacts on school attendance[11].

5.4 Benefit incidence and welfare dominance

Benefit incidence has become a fairly standard first line method of assessing the impact of public expenditures. BIA involves three steps: valuing public services (estimating the unit cost or unit subsidies implied by the provision of public services), imputing the unit subsidy to households or individuals who use the service, and aggregating individuals or households into subgroups of the population to compare the distribution of the subsidy among different groups. One key issue is the degree of progressivity in benefits, usually depicted via concentration curves. The concentration curve is a normative tool similar to the Lorenz curve, and plots the cumulative shares of individuals in the population, ranked by household expenditure per capita/per equivalent adults on the *x*-axis and the cumulative shares of benefits on the *y*-axis. However, unlike the Lorenz curve, which represents the cumulative percentage of total income held by a cumulative proportion of the population (after ordering income in increasing magnitude), a concentration curve can lie above the diagonal – the poorest 40 per cent of the population cannot earn more than 40 per cent of total income, but they can receive more than 40 per cent of total benefits from public spending (Hakro and Akram, 2007).

The concentration curves are compared against two benchmarks – Lorenz curve of household expenditures and the 45-degree line as shown in Figure 1 – which yields two measures of progressivity: "Expenditure progressivity" or simply progressivity and "per capita progressivity" (Younger, 1999; Sahn and Younger, 2000). If a concentration curve is at all points above (dominates) the Lorenz curve then the benefit is said to be progressive – it is more equitably distributed than household expenditures.



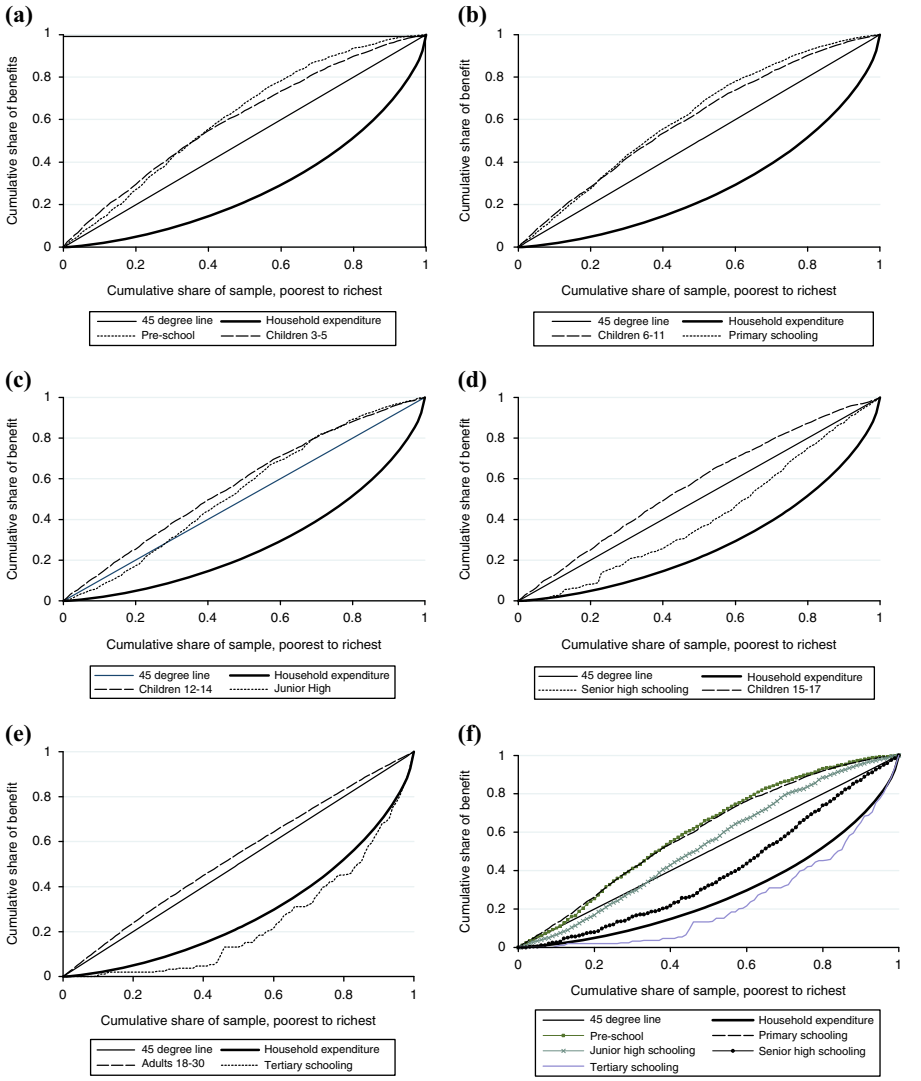
Source: Hakro and Akram (2007)

Figure 1. Lorenz and concentration curves

A concentration curve that lies above the diagonal (45-degree line) is said to per capita progressivity (pro-poor) – poorer households receive disproportionately larger shares of the benefit. A concentration curve that lies below the Lorenz curve is classified as regressive – the benefit accrues disproportionately to the wealthy. It is also possible to rank different services according to their progressivity. For example, a given subsidy is said to dominate another if its concentration curve is everywhere above the concentration curve for the other. The results of this analysis are presented in Figure 2 and Table V.

We begin by estimating the incidence of public education expenditures for all levels of education (primary, secondary, and post-secondary). Note that benefit incidence and progressivity analyses refer to publicservices only. Subsidies refer to recurrent expenditures on each level of education. Figure 2 presents concentrations curves the for the various education services considered. We first evaluate these curves against our benchmarks of Lorenz curve (household consumption expenditure) and the perfect equality line (45-degree line). One can easily tell which of these services is progressive. The fact that the concentration curves for children dominate the 45-degree line indicates that there are more children in the poorest quintile than in the richest quintile. For instance, 20.8 per cent of school-age children (3-23 years) are found in the poorest quintile (25.5 per cent for poorer households) compared to about 17.9 per cent for the richest quintile (13.0 per cent for richer households), thus showing that poorer households tend to have more children.

Primary (and pre-schooling) schooling benefits are more concentrated among the poorest quintile with the bottom two quintiles receiving a cumulative share of about 41 per cent, indicating that primary education subsidies are definitely progressive. The poorest quintile's rate of participation in public primary is higher than that of the richest quintile (79 per cent against 70.0 per cent) mainly because a large proportion of children in the richest quintile are enroled in private primary. Secondary and tertiary schooling are all dominated by the 45° line, hence are said to be per capita regressive. Benefits from these services accrue more disproportionately to the well-off households; hence are poorly targeted. Senior high (including TVET) is progressive in terms of household expenditures with the poorest quintile receiving 15.5 per cent of the benefits



Notes: "Others" include teacher and vocational training and tertiary includes universities and polytechnics. (a) Pre-school, 2005/2006; (b) primary schooling, 2005/2006; (c) junior high schooling, 2005/2006; (d) senior high schooling, 2005/2006; (e) tertiary schooling, 2005/2006; and (f) all public schools, 2005/2006

Source: Authors estimation based on GLSS5 data

Figure 2.
Concentration curves for public schooling, 2005/2006

of this level compared to 26.3 per cent for the richest quintile[12]. Post-secondary (universities, polytechnics, and teacher education) education is regressive in absolute terms (both in terms of household expenditures and the 450 line) with the richest quintile appropriating 50.3 per cent of the benefits, as shown in Table V. School enrolment statistics show that people are terminating schooling after primary, and

Quintile	% of benefits received 1989	1992	2005	Change in benefits 1989-1992	1992-2005	1989-2005
Primary						
1	21.2	21.8	18.4	0.6	−3.4	−2.8
2	22.1	23.6	22.2	1.5	−1.4	0.1
3	22.2	21.7	21.3	−0.5	−0.4	−0.9
4	20.3	18.8	21.5	−1.5	2.7	1.2
5	14.3	14.0	16.3	−0.3	2.3	2.0
Total of which	100	100	100	0.0	0.0	0.0
Accra	6.3	5.3	2.9	−1.0	−2.4	−3.4
Other-urban	23.1	24.6	20.3	1.5	−4.3	−2.8
Rural	70.6	70.1	76.8	−0.5	6.7	6.2
Secondary						
1	16.8	14.9	16.0	−1.9	1.1	−0.8
2	18.0	21.8	18.3	3.8	−3.5	0.3
3	21.8	21.1	18.3	−0.7	−2.8	−3.5
4	23.4	23.5	22.5	0.1	−1.0	−0.9
5	19.9	18.6	24.9	−1.3	6.3	5.0
Total of which	100	100	100	0.0	0.0	0.0
Accra	11.1	12.0	8.9	0.9	−3.1	−2.2
Other-urban	23.3	30.1	30.9	6.8	0.8	7.6
Rural	65.6	57.8	60.2	−7.8	2.4	−5.4
Tertiary						
1	7.7	6.0	4.0	−1.7	−2.0	−3.7
2	3.8	9.5	5.5	5.7	−4.0	1.7
3	19.2	19.0	17.6	−0.2	−1.4	−1.6
4	19.2	20.2	22.2	1.0	2.0	3.0
5	50.0	45.2	50.3	−4.8	5.1	0.3
Total of which	100	100	100.0	0.0	0.0	0.0
Accra	42.3	27.4	27.1	−14.9	−0.3	−15.2
Other-urban	34.6	47.6	47.2	13.0	−0.4	12.6
Rural	23.1	25.0	25.6	1.9	0.6	2.5
All education						
1	17.1	16.4	14.8	−0.7	−1.6	−2.3
2	17.0	20.7	17.5	3.7	−3.2	0.5
3	21.4	21.0	19.4	−0.4	−1.6	−2.0
4	20.8	21.1	22.0	0.3	0.9	1.2
5	23.7	20.8	26.3	−2.9	5.5	2.6
Total of which	100.0	100.0	100	0.0	0.0	0.0
Accra	15.6	11.6	10.0	−4.0	−1.6	−5.6
Other-urban	25.7	30.5	29.6	4.8	−0.9	3.9
Rural	58.7	57.9	59.2	−0.8	1.3	0.5

Notes: 1989, 1992 (estimated by Demery *et al.*, 1995), 2005 (author's own estimations). 1989 is ranked by household expenditure per capita, 1992 and 2005 are ranked by household expenditure per adults equivalent

Table V.
Distribution of public education subsidies: 1989-2005

largely after junior high. This partly explains the less progressivity of post-basic benefits.

Though subsidies to teacher education are more equally distributed than those to universities and polytechnics, its contribution seems too small to affect the overall progressivity of post-secondary subsidies. With regards to gender, males received slightly higher education benefits (51.7 per cent) than women (48.3 per cent) with much disparity coming from secondary (Table V). There was almost equal distribution of

benefits between males and females for post-secondary, mainly because of teacher education which tend to enrol more female students.

Our next task is to evaluate these services against each other - relative progressivity (Younger, 1999). A casual observation of these curves can tell us which services are more progressive. Primary (and pre-school) services are the most progressive since their concentration curves dominate those of all other services, followed by secondary, which in turn is more progressive than post-secondary; a pattern that has become standard for developing countries (Glick and Razakamanantsoa, 2006)[13]. The analysis of school enrolment rates shows that a number of children in poorest households tend to terminate their schooling at primary level, and some at JHS. Thus, the widening gap between primary and secondary education is a reflection of this trend.

5.5 Changes in the incidence of education subsidies: 1989-2005

Here we consider the change in the benefit incidence of public education spending by comparing the results to Demery *et al.* (1995). The study of Demery *et al.* (1995) is based on the GLSS 2 (1989) and 3 (1992) while the present study is based on GLSS 5 (2005/2006), all of which are nationally representative household surveys conducted by the GSS. For the sake of this comparison, we group pre-school and primary into primary education; JHS, SHS, and TVET are grouped into secondary, while universities, polytechnics, and teacher education are grouped into post-secondary. After basic school (JHS), children can either enrol in SHS or TVET. However, SHS is required for tertiary (university and polytechnic) and teacher training. For 2005, the benefit to secondary is a weighted average of JHS and SHS (including TVET). The poorest quintile remains the smallest beneficiary of total education benefits, showing a declining share of total benefits between 1989 and 2005. For instance, the share of total benefits accruing to the poorest quintile has declined by 2.3 percentage points; falling from 17.1 per cent in 1989 to 14.8 per cent in 2005. It declined by 0.7 percentage point between 1989 and 1992, and further by 2.6 percentage points between 1992 and 2005, as shown in Table V. The bottom two quintiles accounted for an accumulated share of 32.3 per cent of total benefits in 2005 compared with their cumulative income share of about 16 per cent. The richest quintile, however, appropriated 26.3 per cent of total education benefits in 2005, gaining by 5.5 percentage points between 1992 and 2005 and 2.6 percentage points over the period 1989-2005 (Table V). The bottom two quintiles witnessed a decrease in primary education benefits over the period 1992 and 2005, with benefits decreasing by 3.4 and 1.4 per cent, respectively, over this period.

After primary education, benefits accrue disproportionately to the richest quintile. For instance, the poorest quintile received 14.9 per cent of secondary[14] education benefits in 1992 and 16.0 per cent in 2005, indicating an increase of 1.1 percentage points. The richest quintile on the other hand has gained by 6.3 percentage points over this period (rising from 18.6 per cent in 1992 to 24.9 per cent in 2005). The poorest quintile continues to make a generally poor showing in tertiary education compared with the richest quintile (4.0 per cent against 50.3 per cent). Between 1992 and 2005, the poorest quintile's share of tertiary education benefits has declined by 2.0 percentage points while the richest quintile's share has increased by 5.1 percentage points (Table V)[15].

The share of rural areas in total education subsidies has increased by 1.3 percentage points between 1992 and 2005, with its share of the total benefits remaining consistently high (58.7, 57.9, and 59.2 per cent in 1989, 1992, and 2005, respectively). In terms of education levels, rural areas received 77.1 per cent of primary education subsidies in 2005 (rising by 7.0 percentage points from 70.1 per cent in 1992). It also received

60.2 and 25.6 per cent of secondary and post-secondary subsidies, respectively, in 2005. Accra's share of primary education benefits have decreased consistently between 1989 and 2005, with its share in total education subsidies dropping by 5.6 percentage points over this period (Table V).

5.6 Valuation of public education services based on the CV

The above analysis is based on the standard benefit incidence approach which is often criticized for its arbitrary valuation of public services[16]. The alternative is to use benefits estimated from the school choice model. CV is that amount of money that when subtracted from the individual's income in the new state (1) makes utility in the new state, with the subtraction, equal to utility in the original state (0). That is:

$$V = c\left(Y_i - P_j^1\right) + + YQ_j + \delta_j X_i + \varepsilon_j^1 = c\left(Y_i - P_j^0 - CV\right) + YQ_j + \delta_j X_i + \varepsilon_j^0 \quad (7)$$

where P^0 is price in the original state, P^1 is price in the new state, etc. In the method developed by Morey and Rossman (2007), it is supposed that the household-specific epsilon terms are the same in both states and therefore cancel by assumption. We use the NMNL estimates presented above to calculate CV for public schooling, which we then used to assess the benefits of public schooling to households.

Specifically, for a household where public schooling is the best option and private schooling provides the second highest level of utility, CV is defined implicitly by the following equation:

$$CV = \left(Y - P^0\right) - e^{\left(\frac{\left(V_{private} - V_{public}\right)}{\alpha}\right)}\left(Y - P^1\right) \quad (8)$$

where V_{public} and $V_{private}$ are the estimated utilities associated with public and private options, respectively, α is the coefficient of net income. In the case where the second best option for a household is no schooling then we replace $V_{private}$ by 0. Where the best option is either "no schooling" or "private schooling", then $CV = 0$.

Our finding agrees largely with Younger (1999) that the method of valuation does not affect the ranking of social services. Services that are (per capita or expenditure) progressive with one method is in most cases so with other methods. What is, however, unclear, is the order of progressivity. For both pre-school and primary schooling, the standard method is obviously the most progressive, followed by the uniform and then the CV. For secondary schooling (only senior high), however, the test could not confirm dominance of any one method over another.

6. Conclusion

In this paper, we have examined distribution, coverage, utilization as well as the benefit incidence of public education spending in Ghana, considering all levels of education - pre-schooling, primary, secondary, and tertiary. The demand estimates show that price and income are important determinants of school enrolments. The fact that the demand for schooling by the poor is more price elastic than the rich suggests that price increases for public schooling will have negative implications for equity. Increases in cost will result in a larger than proportionate reduction in demand among the poor compared with the wealthy, making the distribution of public primary school benefits less progressive. From our policy simulations, though setting prices to zero led to dramatic increases in school enrolment, the high probability of non-attendance reflects the high

opportunity cost to schooling. A high proportion of school-age children are found to be terminating their schooling at primary and many more at the junior high school level.

Standard fiscal incidence analysis suggests that overall public spending can be made more progressive by increasing subsidies (i.e. lowering cost) on services used relatively more by the poor while decreasing subsidies (raising cost) on services used by the rich. This implies that since secondary, and most especially, tertiary schooling are dominated by the top income group, welfare can be improved by reallocating public expenditures to primary (or basic) schooling. In Ghana, the highest rate of return (social and private) occurs at the senior secondary level (followed closely by primary). At the same time, the poor tend to terminate education at primary (or basic level). It is, therefore, important to make post basic education more accessible to the poor in order to provide them with higher earnings potential, thereby helping to lift them out of poverty.

Notes

1. Public social spending has increased consistently during the last decades, reaching over 23 per cent of total government expenditures and over 57 per cent of discretionary expenditures in 2005.
2. Two general approaches have been widely used to assess the welfare impact of public spending: first, benefit incidence studies (BIA), and second, behavioural approaches. BIA has been criticized because: it is static, it assigns the same unit costs to all users of public services, it assumes all users benefit equally from public services, and it does not have behavioural foundations and therefore cannot be used for policy simulations. The behavioural approach (also called the willingness-to-pay), on the other hand tends to gloss over the distributional implications of the demand estimates (Younger, 1999) and the expenditures financing those public services.
3. The reforms have replaced the four-year middle schools with a three-year junior secondary, and reduces senior secondary from seven years – five years ordinary level and two years advanced level - to three years. Primary and junior secondary have become basic education.
4. The central government remains the main financier of education, contributing about 82.0 per cent (including the GETFUND) of total education spending between 2003 and 2008.
5. The programme was first piloted in 40 most deprived districts in 2004. Gross enrolment shot up by 14.5 per cent while that of pre-school was 38 per cent. Given its success, the programme was adopted nationally in 2005, which offers GH¢2.5 per boy child and GH¢3.5 per girl child to cover school fees and levies such as cultural dues, sports dues, and development levies.
6. An issue is the functional form for net income, $c\ (Y_i - P_j)$, for which there is no consensus in the literature. Previous authors have used various specifications: linear (Akin, 1985; Dor and van der Gaag, 1993), quadratic (Gertler and van der Gaag, 1990; Gertler and Glewwe, 1990), and logarithmic, Younger (1999, 2000).
7. The nested logit reduces to the conditional logit if the two dissimilarity parameters are both equal to 1 (Cameron and Trivedi, 2009).
8. Tertiary is, however, included in the BIA.
9. For secondary school, some authors include even children of secondary age who have not yet graduated from primary school (Younger, 1999). Secondary includes only senior high.
10. This is what Younger (1999) called the "sheepskin effect", which shows the fact that: returns to schooling is not simply the accumulation of human capital (which suffers from diminishing marginal return); rather it signals achievement by the completion of a level and the reward of a particular degree; one is more likely to attend a good school for several years than a bad one, reflecting the unobserved quality differences in schools.

11. A similar trend was observed by moving everybody out of the poorest quintile, which involves awarding the minimum income in the 2nd quintile to all households in the poorest quintile.
12. Junior high and senior high (including TVET) all dominate the Lorenz curve of household expenditures. Junior high crosses the 45-degree line – the poorest quintile captured 16.2 per cent of subsidies to this level compared to 18.9 per cent for the richest quintile. For this service, all quintiles received higher benefits than the richest quintile, with the exception of the bottom quintile.
13. More pointedly, primary is the most progressive, followed by JHS, SHS/TVET, and then post-secondary. Subsidies to TVET/TTC dominate those of SHS. The poorest quintile's share of post-secondary benefits was only about 4.0 per cent.
14. For 2005, the benefit to secondary is a weighted average of JHS and SHS (including TVET).
15. Ranking in terms of expenditure per capita, the change in tertiary benefits for the richest quintile was 21 percentage points as against a decline of 5.5 percentage points for the poorest quintile.
16. For instance, by assigning the same unit cost to all observed users, the standard approach is assuming that all households benefits equally from public services. In practice, however, children from poorer households are more likely to attend poorer quality schools compared to children from wealthier homes.

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