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Public Social Spending and Poverty in Tanzania: A Benefit Incidence Analysis

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Abstract

Research on poverty in relation to public spending has never been as vigorous as it is now. Public spending has along-run effect in reducing the likelihood of being poor. This study estimated the benefit incidence analysis, progressivity of benefit and marginal benefit incidence of public spending on selected social utilities in Tanzania using the household budget surveys of 2000/01 and 2007. Benefit incidence and progressivity of benefit were estimated using the distributive analysis stata package procedure. The result of the analyses shows that public spending on social utilities in Tanzania is not pro-poor. The marginal benefit incidence analysis shows that the poorest quintile can only benefit more than the richest quintile from extra spending on the social utility in which the current accessibility is high. This is mostly the case of primary education as estimated in this study. Finally, from the findings of this study we recommend more efforts by the government to make public spending in Tanzania pro-poor to accelerate the speed at which the poor benefit more from increases in access to social utilities. One of the major ways in which the government can make public spending pro-poor is spending on the sectors that benefit more the poor people such as on social infrastructure (health and education), and on agriculture.

JEL Classification: D21

Keywords: social spending, poverty, benefit incidence analysis, Tanzania

Background Information

Benefit incidence analysis (BIA) is widely used to infer to the distributional impacts of public spending. BIA is used to understand the distribution of benefits in comparison to income distribution (Bowser et al., 2019). Two steps are involved in the analysis of benefit incidence. The first is the analysis of the unit cost of providing any service, which is based on the officially reported public spending of the service in question; and the second is the analysis of the pattern of utilization of the service between poor and rich households.

Theoretical literature on the impact of public spending on poverty using incidence analysis categorizes two approaches. The first is measuring individual's own valuation of the services (Aaron & McGuire, 1970; De Wulf, 1981); and the second, is utilizing the cost of providing public service with background information on their use and then estimating how these services are distributed across various income distribution groups (Shepherd et al. 2017; Castro-Leal et al., 1999;

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Demery, 2003; Davoodi et. al, 2003). Public spending on education and health has been increasing in Tanzania; and therefore it is important to assess their distributional impact on the poor. This study explored the relationship using the cost of provision and information on the users. The study was motivated by the fact that there has been a long-standing interest in economics in measuring the benefits derived from public spending (Castro-Leal et al., 1999; Gafar, 2006) through benefit incidence analysis.

The standard BIA method describes who is currently benefiting from a particular public expenditure and as such, it is a useful tool to guide the effects of a policy change that distributes benefit in proportion to current benefits (Younger, 2003). It also indicates how effectively governments allocate limited resources towards meeting the needs of the poor (Bowser et al., 2019). The current situation of education and health sectors in Tanzania, as well as their importance in improving the livelihood of the people, necessitates their inclusion among indicators to measure the impact of public spending.

This study is an attempt to contribute knowledge to the understanding of the impact of public spending on poverty in Tanzania. The trend in public spending—both in absolute terms and as a share of GDP in Tanzania—has been increasing overtime. Existing statistics show that children in education for primary (secondary) level have improved from 54% (5%) in 2000 to 84% (15%) in 2007. Nevertheless, to what extent are the poor benefiting from public spending on education in relation to the rich? How can the increase in public spending in education and health benefit the poor? Will the increase benefit the poor more than the rich, or vice versa?

It is important to assess to what extent spending in education and health has benefited various quintile wealth categories in Tanzania over time. There is a need not only to have knowledge on benefit incidence of public spending, but also to know who will benefit from further expenditure as Tanzania increases her budgetary allocation to the health and education sectors. This, therefore, constitutes the problem that this study aims to investigate to determine the benefit incidence and marginal incidence of public spending in Tanzania.

Literature Review

Theoretical Literature Review

Studies on the impact of public spending and poverty revolve around an analysis of the benefit incidence of public spending. Benefit incidence analysis is understood in relation to the concepts of targeting and progressivity of social spending. Targeting is a tool used to select eligible beneficiaries of any government intervention. All targeting mechanisms share a common objective: to identify correctly which households or individuals are poor, and which are not. Targeting is a means to increase efficiency of a programme by increasing the benefits that the poor can get with a fixed programme budget (Coady et al., 2004).

One way to assess the targeting of government spending is by using a concentration curve. A concentration curve is generated by plotting the cumulative distribution of benefits of public spending on the *y-axis* against the cumulative distribution of population sorted by per capita income on the *x-axis*. One can assess the progressivity or regressivity of a public subsidy by comparing the benefit concentration curve with the 45-degree diagonal, and the Lorenz curve of income or consumption.

The diagonal line indicates neutrality in the distribution of benefits, reflecting the perfect equality; hence can be referred to as the perfect equality line. The distribution of benefits is said to be progressive in absolute terms if the lower income groups receive a larger share of the benefits from government spending than the richer income groups. In this regard, if the poorest 20% of the population gets more than 20% of the benefits, the concentration curve will lie above the diagonal line. If the benefit concentration curve lies below the diagonal, then the poorest 20% of the population gets less than 20% of the benefits, and thus the distribution of benefits is said to be regressive in absolute terms. A benefit concentration curve that lies above the Lorenz curve of income signifies progressivity of public subsidy relative to income (Hakro & Akram, 2007). If the same lies below the Lorenz curve, it signifies regressivity; meaning that transfers are more regressively distributed than income.

Theoretical literature on benefit incidence has three distinct periods. In the early 1975 literature, benefits were allocated to households either on a per capita basis or in proportion to the income of a household. Both allocation mechanisms yield obvious conclusions about benefit incidence. These studies are criticized as they did not account for different income elasticities for different public services.

The second wave of benefit incidence analysis studies in both developed and developing countries turned to the allocation of expenditure made on goods that are more specific to households, using micro data on household utilization of public services. Examples of authors in this perspective include Reynolds and Smolensky (1977) for the US, Meerman (1979) for Malaysia, and Selowsky (1979) for Colombia.

In the third wave, studies estimated demand curves for various social services (Glewwe, 1991). Demand curves for particular population subgroups can be used to calculate changes in welfare-based measures of social services benefits. Studies using welfare-based measures of benefits for a wide range of public functions can yield valuable information to policy makers and help target limited resources for redistribution towards public services, which usually have maximum benefit to the poor.

Thus, the theoretical literature on the impact of public spending on poverty using incidence analysis has categorized two approaches: (i) measuring individual's own valuation of the services; and (ii) utilizing the cost of providing public services with information on their use and then estimating how these services are distributed across various income distribution groups. The benefit incidence analysis combines the cost of providing public services with information on their

use to show how government-spending benefits are distributed across the population. Unlike the marginal benefit incidence, average incidence is easily established on items such as education, health, and transfers than on others like roads, police, or diplomatic services.

The theoretical model for marginal benefit incidence analysis extends the framework proposed by Ajwad (1999) for analysing allocation rules for investments in public services by local governments. The Ajwad's framework focuses on an administratively autonomous unit, namely a department. The department is in turn divided into two municipalities: one with rich residents (R), and another with poor residents (P). The local government at the department level is responsible for public investments in public services; in this case education and health. The department has an exogenously determined budget constraint (E) for each of the services. This budget can be allocated between rich and poor municipalities, subject to$E = E_R + E_P$; where E_R and E_P are the investments for expanding access in the rich and poor municipalities, respectively. The household access rate in each municipality is $S_i = f_i(E_i)E_P$ for $i = R, P$.

This specification enables municipality characteristics to affect the impact of investment expenditures on access rates. The functions $f_R$and f_P increase and strictly concave, such that $f_i^{'}(E_i) > 0$ and $f_i^{''}(E_i) < 0$ for $i = R, P$. Thus, the rates of access increase when investment expenditures increase, while the marginal gains diminish with expenditures. For any given level of public spending, it is assumed that the access rate in a rich municipality is higher than the access rate in a poor municipality. In the case of both public sectors under consideration, it is assumed that $f_P^{'}(e) < f_R^{''}$ for all expenditure levels between 0 and E. Thus, access to schools and health services is higher in a rich municipality.

For education, it can be assumed that an increase in public expenditures raises school enrolment rates more in poor than in rich municipalities; so that $f_P^{'}(e) < f_R^{''}(e)$ for all $e \in [0, E]$. This is because, those living in rich municipalities would send their children to school anyway, even to a school that is located at a distance, if their own municipality has a low density of public schools. Thus, the absence of public schools in a rich neighbourhood poses a smaller problem than a similar absence in a poor neighbourhoods.

The resource constraint $E = E_R + E_P$ and the functions $f_i^{'}(E_i) > 0$ for $i = R, P$ can be combined to generate a transformation curve for the relationship between access rates in both municipalities. Writing the access rates as $S_R = f_R(E - E_P)$ and$S_P = f_P(E_P)$ in rich and poor municipalities, and totally differentiating these two functions, yields $dS_R - f_R^{'}(E - E_P)dE_P$ and$dS_P = f_P^{'}(E_P)dE_P$. Therefore, the slope of the transformation curve is:

$$\frac{dS_R}{dS_P} = \frac{-f_R^{'}(E - E_P)}{f_P^{'}(E_P)} < 0 \qquad (1)$$

This means that, with a fixed budget, an increase in the access rates through investment expenditures in one municipality implies that the increase in access rate in the other municipality would be lower. The transformation curve is concave because differentiating equation (1) with respect to S_P yields:

$$\frac{d^2S_R}{dS_P^2} = \frac{\left(f_P^{'}(E_P).f_R^{''}(E-E_P) + f_P^{''}(E_P).f_R^{'}\left(E-E_p\right)\right)\left(\frac{1}{f_P^{'}(E_P)}\right)}{(f_P^{'}(E_P))^2} < 0 \qquad (2)$$

Given the framework of the above theoretical model, there can be at least three possible outcomes. First, an increase in public service access benefits only the rich for both education and health sectors. This suggests that policymakers favour the welfare of the rich, possibly due to the lobbying power the rich possess. Second, an increase in public service access benefits the poor for both services. This outcome may result if policymakers favour the poor, or if they pursue a strategy of equalizing outcomes for both services. Third, increases in access to one sector benefit the rich, while the other sector benefits the poor quintile. This can be explained by the presence of public-private intervention in the provision of public services.

Empirical Literature Review

The earliest examples of analyses of the incidence of public spending are studies by Gillespie (1966) on Canada and the US. The methodology of Benefit Incidence Analysis in its present form was introduced in two studies from developing countries: first by Selowsky (1979) on Colombia, and secondly by Meerman (1979) on Malaysia. These studies have been replicated in several other studies both in developed and developing countries; the most recent being that of Cuenca (2008) in the Philippines.

In the case of Philippines, Cuenca (2008) presented graphically the benefit incidence of the 1998 public spending on education using deciles based on households. She found out that government spending in elementary and secondary education was progressive in absolute terms as the concentration curves lied above the diagonal, while government spending on college education was regressive in absolute terms as indicated by the fact that its concentration curve lied below the diagonal. The progressivity in elementary and secondary education that are publicly funded is caused by the fact that richer households prefer private schooling to public schooling, and households in the poorest deciles have more children than those in the richer deciles.

Using household budget survey data for the Caribbean countries, Gafar (2006) showed that primary and secondary education and basic health care benefit the poor while the non-poor are principal beneficiaries of tertiary education, education subsidies, and hospital spending. He used the benefit incidence analysis to demonstrate which income groups have been the principal beneficiaries of public spending on education, health and infrastructure services.

Demery (2003) shows that the concentration index for South Africa for all levels of education was -0.023, which was below the mean of 0.01 for all the 25 countries for which data were available. This indicates that South Africa education's spending was better targeted than most African countries, despite the fact that university education in South Africa was poorly targeted.

A policy change that increases spending would not necessarily go to existing beneficiaries in proportion to their current benefits, or even go to existing beneficiaries at all. In this respect, average benefit incidence analysis may be insufficient in analysing the distributional effects of public spending (Younger, 2003). Following these observations, several recent studies have proposed alternative methods to measure the marginal benefit incidence analysis of public spending. Marginal benefit incidence analysis measures the incidence of actual increases or proposed cuts in government spending. The simplest way to identify marginal incidence is to compare average incidence across geographic areas with different degree of programme sizes. This is essentially the method employed by Lanjouw and Ravallion (1999), whose study in Ghana found out that primary school enrolment rises with household expenditure per capita at national level and in all states. They indicated that enrolment tends to be low for the poorest quintiles, and increases as consumption per person increases. Their marginal benefit (average odd of enrolment) suggests that subsidies to primary schooling would mildly favour the rich.

Ajwad and Wodon (2007) in their study in Bolivia indicate that participation rates in pre-primary, primary, and secondary schools increase with municipality wealth. Primary school participation rates for the poorest quintile was 77%, while for the richest quintile the primary school participation rates was 121% of the overall rates. The overall increases in participation rates in pre-primary, primary, and secondary schools appeared to benefit more the poor and middle-income municipalities than the rich municipalities.

The most recent study on BIA is by Bowser et al. (2019)on India, titled "Benefit Incidence Analysis in Public Health Facilities in India." The study outlines the benefits of utilization on health services at the national and state levels; and reveals that government spending on public health has not resulted in significantly pro-poor services. Unlike Bowser et al.'s (2019) BIA analysis, our study makes a tier level analysis, namely concentration curve analysis, average benefit and marginal benefits and also use two sectors—namely education and health—to establish diversity in methodological approaches.

Methodology

Conceptual Framework on the Methodology

The measurement and valuation of benefits of public spending on publicly provided goods has vexed economists for a long time (Jackson et al., 2016). There are two broad approaches that have been used to measure the value of government subsidized goods and services to beneficiaries. The first one is based on the Aaron

and McGuire (1970) methodology, which emphasizes individual own-valuation of the good and service; and the second approach values publicly provided goods at their marginal cost. The second is known as the benefit incidence analysis (BIA).

The benefit incidence analysis combines information on the utilization of government services by households with information on the cost of providing said services to assess the incidence of the benefit from government spending across household groupings based on household per capita income. Since expenditures on health and education are expected to have a redistributive impact, BIA is centred on assessing whether public spending improves the distribution of welfare proxy by household income or expenditure. Likewise, BIA shows how well public spending redistributes resources to the poor (van de Walle, 1995) by showing how much the income of a household would have to be raised if the household would fully pay for the subsidized public services (Sabir, 2003). This is well understood in relation to the concept of targeting. Targeting is assessed with reference to the graphical representation of the distribution of benefits, using concentration curve or by the index computed from the curve.

A concentration curve (CC) is generated by plotting the cumulative distribution of 'benefits' of public spending on the *y*-axis against the cumulative distribution of population sorted by per capita income or consumption. Progressivity and regressivity are assessed by comparing the concentration curve with the 45-degree diagonal. Progressivity implies a preference for lower income groups, while regressivity implies a more favourable treatment of higher income groups (Manasan et al., 2007).

The numerical measure of the concentration curve is given by the *concentration coefficient*, which is a ratio of the area bounded by the diagonal and the concentration curve to the total area below the diagonal. When concentration coefficient is < 0, it indicates that benefits are progressive in absolute sense, and when it is > 0, benefits are regressive in absolute sense. On the other hand, if the concentration coefficient is algebraically smaller than the Gini coefficient, the distribution is said to be progressive relative to the distribution of income (Manasan et al., 2007).

The average BIA only shows who the current beneficiary of public spending is. This is done by imputing benefit of such current spending on the given sector. It does not show what impact would an increase in spending have on different social economic groups. It is marginal benefit incidence analysis that shows the beneficiaries of improvement of access.

Marginal benefit incidence analysis asks two key questions. First, do the poor people benefit from an expansion in access to public service more or less than the non-poor? Second, do those benefits depend on the existing level of access? The answers to these questions are essential in empowering the poor, as well as on the formulation of policies for poverty reduction and sustainable development.

Analytical Methodology

Average Benefit Incidence

The standard methodology of BIA combines the cost of providing public services with information on their use to show how the benefits of government spending are distributed across the population. An average BIA involves four (4) key steps:

(a) Estimating the unit cost of providing the service per person in the current expenditure;
(b) Imputing the unit subsidy to household or individuals who are the users of the services;
(c) Ranking households according to a welfare indicator and aggregating them into subgroups of beneficiaries such as deciles or quintiles by income or expenditure per capita; and
(d) Deriving distribution of benefits by multiplying the average benefit by number of users in each income or expenditure group.

Unlike simple descriptive statistics, BIA condenses the distribution of benefits over the population into a single number, similar to Gini coefficient, which can be used to compare results across time, location, and gender (O'Donnell et al. 2016). In this respect, BIA provides a quantitative evidence and equity aspects (Asante et al. 2016)

The four steps above can be illustrated by simple algebra using the case of education spending. The total benefits from government spending on education (primary, secondary, and tertiary) accrued to group j would be estimated as:

$$X_j = \sum_{i=1}^{3} E_{ij} \frac{S_i}{E_i} == \sum_{i=1}^{3} \frac{E_{ij}}{E_i} S_i \qquad (3)$$

where $j = 1,2,3,4,5$; X_j is the benefit incidence in TZS accrued to income or consumption group j of government spending on level i of education (primary, secondary, tertiary), denoted by S_i representing total spending in sector i, measured in TZS. E_{ij} represents the number of students enrolled in level i from group j where each group is a quintile, and S_i/E_i is the unit cost of providing education at level i, where i can be primary, secondary, or tertiary.

The benefit incidence of total education spending in this study was primary school enrolments (E_{pj}) times the unit cost of primary school place, plus the number of secondary enrolments times the secondary unit cost, plus the number of tertiary enrolments, times the unit cost of tertiary education.

$$X_j = E_{pj} \frac{S_p}{E_p} + E_{sj} \frac{S_s}{E_s} + E_{tj} \frac{S_t}{E_t} \qquad (3a)$$

Dividing both sides of equation (3) by total government education spending (S) produces the share of benefits accrued to a quintile from total government spending on education. This gives us:

$$x_j = \sum_{i=1}^{3} \left(\frac{E_{ij}}{E_i}\right) x \left(\frac{S_i}{S}\right) = \sum_{i-1}^{3} e_{ij} s_i \qquad (4)$$

where $j = 1,2,3,4,5$; $x\_j = X\_j/S$; e_{ij} is the quintile j share of total students enrolled at primary, secondary, and tertiary levels; s_i is the share of government spending for a given level i in total education spending, and $S = \sum_{i=1}^{3} S_i$. The quintile percentage shares would be computed from the household budget survey data using the DASP software in the STATA programme.

Equation (4) shows that the more the government spends on the education level that is more widely utilized by a given quintile, the more that quintile benefits. In other words, benefits incidence depends on the composition of the users of education services as defined by the users' income/consumption (E_{ij}), and the composition of education spending (S_i). The equation would capture the joint behavior of users and the government. Therefore, what determine a quintile incidence are the quintile's average participation rate e_{ij} and the intersectional allocation of education spending s_i by the government.

Combining the unit cost data with information on the use of publicly subsidized education from household surveys would yield estimates of the benefit incidence of government education spending. The estimation for the average incidence analysis was done using the DASP V. 2.1 software in the STATA programme.

Progressivity of Benefits

The progressivity of the benefit incidence is done by graphing the concentration and Lorenz curves, and estimating the concentration and Gini coefficients. Graphing the concentration and the Lorenz curves in the same graph is a little bit complicated because while the earlier involves cumulative distribution of 'benefits' of public spending on the y-axis; the latter involves the cumulative distribution of income on the y-axis as well. In order to circumvent this inconvenience, this study estimated the indices and made the appropriate conclusions. When the concentration index was positive, it meant that the benefits were regressive in absolute sense, whereas the negative concentration index meant that the benefits were progressive in absolute sense.

Marginal Benefit Incidence

Public sector spending is dynamic in levels and in compositions, both geographically and functionally. Marginal benefit incidence analysis would help account for the distributional implication of such changes in government budget. It measures increments in access rates for a given public service of a certain income group when there is a change in aggregate participation or in budgets. Such type of analysis normally requires panel data or repeated cross-sections.

However, the key constraint in applying the marginal benefit incidence analysis in developing countries is the lack of such data. However, in their pioneering work, Ajwad and Wodon (2002) and Lanjouw and Ravallion (1999) produced results that circumvented the problem. The approaches from both works were utilized in this study. The objective was to summarize statistics to identify the current beneficiaries of an increase in access.

Accordingly, to estimate marginal benefit incidences by public sector service and expenditure quintile, we can regress the quintile-specific participation rates across regions[1] on the region's participation rate for each public service. Given that a country has $i = 1 \ldots N$ regions; and household assigned to expenditure or income intervals of $q = 1, \ldots, Q$; the mean benefit incidence in interval q for households in region i (X_i^q) and the overall regional mean ($\overline{X}_j$) are derived as:

$$X_i^q = \frac{\sum_{J=1}^{j_i^q} X_{iJ}^q}{J_i^q} \qquad (5)$$

$$\bar{X}_j = \frac{\sum_{q=1}^{Q} \sum_{J=1}^{J_i^q} X_{iJ}^q}{\sum_{q=1}^{Q} J_i^q} \qquad (6)$$

where,

J_i^q = number of households in income interval q for region i;

x_{ij}^q = access rate of the j^{th} household in income interval q and in region i to the public service in question.

To estimate the marginal benefit incidence, that is, who gains from an expansion in the service, we used the geographic variation in access both between households and between regions as a source of information for understanding the diffusion process that generates access. This is done by regressing the incidence in each of the intervals in the regions against the regions' means by Q regressions using the equation:

$$X_i^q = \alpha^q + \beta^q \left[\frac{\sum_{q=1, j=1}^{Q, j_i^q} X_{iJ}^q - \sum_{j=1}^{j_i^q} X_{ij}^q}{\sum_{q=1}^{Q} J_i^q - J_i^q} \right] + \varepsilon_i^q \text{ for } q = 1, \ldots, Q \qquad (7)$$

In the first and poorest interval (q=1), equation (7) yields a regression of the mean level of programme participation in the poorest households in various regions on the mean level of participation in the corresponding region.

Using ordinary least squares to regress incidence in each income interval on regional means returns biased estimates due to endogeneity problem. This is because, in deriving regional mean values, we already have included information from the specific quintile in the left-hand side of the equation. To control this, this

study adhered to Ajwad and Wodon (2002) by using the 'leave-out' mean, which is the average for a region's access rate excluding the quintile in question, as the right-hand side variable.

To avoid endogeneity, the right-hand side variable is computed at the regional level as the mean on all the households, except for those belonging to interval q. We assumed that all the intervals within a region have the same number of households ($J_i^q = J_i$). With$J_i^q = J_i$, then we have $\sum_{q=1}^{Q} X_i^q = Q\overline{X_i}$ and equation (7) can be simplified to:

$$X_i^q = \alpha^q + \beta^q \left(\frac{Q\overline{X_i} - X_i^q}{Q-1} \right) + \varepsilon_i^q \text{ for all } q = 1, \ldots, Q \qquad (8)$$

Pooling all observations from the various intervals together, one estimates (8) as a single regression as follows:

$$X_i^q = \sum_{q=1}^{Q} \alpha^q + \sum_{q=1}^{Q} \beta^q \left[\frac{\sum_{q=1, j=1}^{Q, j_i^q} X_{ij}^q - \sum_{j=1}^{j_i^q} X_{ij}^q}{\sum_{q=1}^{Q} J_i^q - J_i^q} \right] + \varepsilon_i^q \qquad (9)$$

In equation (9), the intercepts and slopes are allowed to differ for each interval, but there is an implicit restriction: it must be that across the various intervals, the average marginal increase if access from a unitary increase in mean access is 1. The restriction is that, the mean marginal benefit incidence estimates for all the categories must be equal to 1; and thus:

$$\sum_{q=1}^{Q} \frac{\beta^q}{Q - 1 + \beta^q} = \qquad (10)$$

Writing β^Q, the parameter for interval Q in relation to other parameters, yields the following restrictions on β^qas,

$$\beta^q = X_i^q = \frac{(Q-1)\left[1 - \sum_{q=1}^{Q-1} \frac{\beta^q}{Q-1+\beta^q}\right]}{\sum_{q=1}^{Q-1} \frac{\beta^q}{Q-1+\beta^q}} \qquad (11)$$

Taking into account the restriction in equation (10), we can rewrite equation (11) as:

$$X_i^q = \sum_{q=1}^{Q} \alpha^q + \sum_{q=1}^{Q-1} \beta^q \left[\frac{\sum_{q=1}^{Q} X_i^q - X_i^q}{Q-1} \right] + (Q-1) \frac{\left(1 - \sum_{q=1}^{Q-1} \frac{\beta^q}{Q-1+\beta^q}\right)\left(\frac{\sum_{q=1}^{Q} X_i^q - X_i^Q}{Q-1}\right)}{\sum_{q=1}^{Q-1} \frac{\beta^q}{Q-1+\beta^q}} + \varepsilon_i^q \qquad (12)$$

Dropping the error term and rearranging the terms in equation (12) yields,

$$X_i^q = \frac{\alpha^q + \beta^q \left(\frac{Q}{Q} - 1\right) \overline{X_i}}{1 + \frac{\beta^q}{q-1}} \text{for } q = 1, \dots, Q \qquad (13)$$

Therefore, change in benefit incidence for the household belonging to quintile q in response to an increase in the aggregate incidence at the regional level is given by:

$$\frac{\partial X_i^q}{\partial \overline{X_i}} = \frac{Q\beta^q}{Q - 1 + \beta^q} \text{for } q = 1, \dots, Q \qquad (14)$$

The right-hand side values $\frac{Q\beta^q}{Q-1+\beta^q}$ in equation (14) are the estimates of marginal benefit incidence. When the coefficient is equal to one, households in a given income quintile benefit from an increase in access as much as the average household does.

When the coefficient is greater than 1, it means that the households in a given quintile benefit more from an increase in access than the average household. Likewise, when the coefficient is less than 1, it means the households in the given quintile benefit less than the average household.

The marginal benefit incidence is obtained for primary, secondary and tertiary enrolment using the HBS 2000/01 and the HBS 2007. The average benefit incidence of public spending on education was done using the Household Budget Surveys of 2000/01 and 2007, employing the distributive analysis Stata package (DASP 2.1).

Results and Interpretation

The Benefit Incidence of Public Spending on Education

The education sector was divided into three levels, namely: primary, secondary, and tertiary levels. The groupings were divided into quintiles, from the poorest quintile to the richest quintile using net household expenditure on food and non-food adjusted to adult equivalent scales. This was also considered in the measuring of welfare and a variable of interest in the DASP analysis. The information on users was derived from the HBS 2000/01 and HBS 2007, while that for public spending was derived from the 2000/01 and 2007/08 financial years.

The expenditures were only recurrent expenditure, justified by the fact that it was only from the recurrent expenditure that the immediate benefit could be derived. The analysis of the benefit incidence on education was done at four (4) levels. The first level was analysis by quintiles (shares and participation); secondly, analysis by groups (location and sex); followed by analysis of the average benefit incidence at the level of eligible members and at the level of members who use the public service in question. Fourthly, we analysed the proportion of benefits by quintile groups and by sectors.

Analysis by Quintiles

The first step was to analyse the different shares of benefits by quintile groups. Using the HBS 2000/01, the findings showed that, the share of benefits from the government spending on education by quintiles groups show household members in the poorest quintiles shared about 17.5% of public spending on primary education; 17.2% of public spending on secondary education, and only about 11.6% of public spending on the tertiary education. The richest quintile shared about 22.7% in the public spending in primary education; 22.7% in the secondary education, and about 40% in the tertiary education (Table 1). For the HBS 2007, it was established that household members in the poorest quintile shared about 19.8%of the public spending on primary education; 14.2% on secondary education, and 2.6% on tertiary education.

Table 1: Share by Quintile Groups

Groups	HBS 2000/01			HBS 2007		
	Primary	*Secondary*	*Tertiary*	*Primary*	*Secondary*	*Tertiary*
Poorest Quintile	0.1753	0.172	0.116	0.198	0.142	0.026
Quintile 2	0.186	0.186	0.163	0.197	0.142	0.150
Quintile 3	0.196	0.196	0.153	0.207	0.174	0.167
Quintile 4	0.216	0.216	0.163	0.201	0.241	0.141
Richest Quintile	0.227	0.227	0.405	0.246	0.302	0.516
All	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

Source*:* Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

The richest quintile on the other hand, shared about 24.6% on primary education; 30% on secondary education, and 51% on tertiary education (Table 1). In both HBS 2000/01 and HBS 2007, the richest quintiles have significantly the largest share in tertiary education. This could probably be explained by cost-sharing, and education background, which was directly linked to the types of schools attended, as well as performance. In addition, the loan-giving criteria was likely to leave a majority of students from the poorest quintiles from joining the tertiary level education.

The most important observation in the findings on shares by quintiles in the education sector is that, the richest quintiles had significant shares in tertiary education, and also dominated shares in secondary education. The poorest and the poor quintiles had a majority shares in primary education sectors as shown in Table 1.

The second step was to analyse the rate of participation, or rather the accessibility rates, in the education sector (primary, secondary, and tertiary by quintile groups), location, and sex. Table 2 indicates that access to the various education levels was 73% for primary education, 12% for secondary education, and about 1% for tertiary education by using the HBS 2000/01; while the rates by using the HBS 2007 were 26.6%; 8.9% and 2% for primary, secondary, and tertiary levels, respectively. The analysis shows that in the HBS 2000/01, about 43%, 2%, and 0.3% in the poorest quintiles were enrolled in primary, secondary, and tertiary education levels, respectively. On the other hand, about 17%, 32% and 3% from the richest quintiles accessed primary, secondary, and tertiary education levels in Tanzania (Table 2).

Table 2: Rate of Participation by Quintile Groups

Groups	HBS 2000/01			HBS 2007		
	Primary	*Secondary*	*Tertiary*	*Primary*	*Secondary*	*Tertiary*
Poorest Quintile	0.434	0.021	0.003	24.719	8.404	0.027
Quintile 2	0.522	0.047	0.005	23.992	7.710	0.025
Quintile 3	0.683	0.081	0.008	25.267	9.227	0.030
Quintile 4	0.851	0.144	0.014	25.927	8.202	0.023
Richest Quintile	0.031	0.327	1.174	32.002	11.077	0.035
All	**0.733**	**0.124**	**0.012**	**26.382**	**8.924**	**0.028**

Source*:* Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

Comparatively, using HBS 2007 participation rates from the poorest quintiles in the education sector in Tanzania were 24%, 8% and 2%, respectively; while those from the richest quintiles were 32%, 11% and 3%, respectively (Table 3). The participation rate in primary school was at the highest level for the poorest quintiles in HBS 2000/01. This could be explained by the fact that a majority from the richest quintiles participated in private primary schools, the English-medium, while a majority from the poorest quintiles participated in public primary education.

The participation rate in tertiary education was higher for the richest quintiles both in the HBS 2000/01 and in the HBS 2007. This could be explained by the fact that participation in tertiary education strongly depends on the performance at both primary and secondary school levels. Those with better foundation could participate more in tertiary education. This explains why a majority of the people from the richest quintiles participate in tertiary education owing to the good background they can afford in both secondary schools as well as primary schools. The participation rate by groups shows that urban group had the highest access to different education levels both in the HBS 2000/01 and in the HBS 2007. The rate of participation in the HBS 2000/01 was 73% for primary education, 12% for secondary education, and about 1% for tertiary education for all the levels; while it was 26.38, 8.92 and 0.02% for the HBS 2007 for all levels, respectively.

Analysis by Groups

The analysis by groups was done using gender disparity. Along the gender divide, the rate of participation of female in the education sector was still low both in the HBS 2000/01 and the HBS 2007. In the HBS 2000/01, 74% of males participated in primary education; 13% in the secondary education, and about 1% in the tertiary education. On the other hand, 69% of females participated in primary education; 9% in secondary education, while only a negligible percent participated in tertiary education. There was an improvement of participation during the HBS 2007, in which male's participation in tertiary education increased from 1% in 2000/01 to 3% in 2007, and the participation of female in the same rose from a negligible percent to about 1% . However, there was lagging behind of female in the education sector in Tanzania. This is summarized in Table 3.

Table 3: Participation Rates in the Education Sector by Location and Sex Groups

Country	HBS 2000/01				HBS 2007			
	Urban	*Rural*	*Male*	*Female*	*Urban*	*Rural*	*Male*	*Female*
Primary Education	0.802	0.624	0.743	0.695	36.495	9.307	0.735	0.454
Secondary Educ.	0.175	0.044	0.133	0.092	10.809	5.029	0.506	0.111
Tertiary Education	0.016	0.005	0.013	0.007	0.040	0.005	0.039	0.018

Source: Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

The general findings in the rate of participation show that, the urban group and male participants had more participation rate in the education sector than the rural group and females. In the case of the rural-urban divide, the findings show that school-/college-going members of households in urban areas participated in education more than the school-/college-going household members in rural areas. Huebler (2005),who noted that children in urban areas in Nigeria had a higher enrolment rate than children in rural areas, observed similar findings on the disparity in the education sector. Moreover, Hazans and Trapeznkora (2008) reported that rural location can be an obstacle to accessibility to secondary school education.

Average Benefit Incidence Analysis of the Education Sector

The average benefits incidence was analysed by quintile groups and by sectors. The analysis was done using data drawn from the HBS 2000/01 and the HBS 2007, as well as from public spending on education for the financial year 2001/02 and 2007/08. The proportion of benefits by quintile groups shows that about 3% of the benefits go to the primary education level; 29% to secondary education. and 66% to the tertiary education level during the HBS 2000/01. However, for the HBS 2007, the proportion of benefits was 4% for the primary level; 36% for the secondary level, and 91% for the tertiary level. The findings are summarized in Table 4:

Table 4: Proportion of Benefits by Quintile Groups.

Groups	HBS 2000/01			HBS 2007		
	Primary	*Secondary*	*Tertiary*	*Primary*	*Secondary*	*Tertiary*
Poorest Quintile	0.004	0.010	0.031	0.008	0.068	0.179
Quintile 2	0.005	0.022	0.054	0.008	0.062	0.163
Quintile 3	0.007	0.038	0.084	0.008	0.075	0.197
Quintile 4	0.009	0.068	0.155	0.009	0.066	0.148
Richest Quintile	0.012	0.155	0.345	0.011	0.090	0.232
All	**0.038**	**0.294**	**0.669**	**0.044**	**0.361**	**0.919**

Source: Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

As a conclusion, the poorest quintiles did not benefit from public spending in the secondary and tertiary education levels in Tanzania during the 2000/01 and 2007 household surveys given the low proportion of benefits as shown in Table 4. This is typical in most developing countries where the poorest groups do not benefit from spending on tertiary education. To increase the pace towards poverty reduction and

achievements of the Millennium Development Goals (MDGs), it is imperative to address the constraints that prevent the poorest quintiles from participating in secondary and tertiary levels of education.

Average Benefit Incidence of Public Spending on Health

The two household budget surveys also report household use of three main categories of public-subsidized health care providers: public hospitals, public dispensaries, and public health centres. Public hospitals include regional hospitals, as well as the district-designated hospitals. However, the public expenditure review in the health sector in Tanzania does not break down public spending into the level of public hospitals, dispensaries, and health centres. As a result, it would be difficult to estimate the benefit incidence without the level of the total public expenditures in each sector. However, the DASP estimation procedure, as indicated in Araar and Duclos (2012), has the advantage of using frequency data approach to estimate the benefit incidence when the information on the level of public expenditure is not available. This study employed the same procedure, and following sections present the findings.

Analysis by Quintile Shares

The poorest quintiles' share in public health services was still low in Tanzania both in the HBS 2000/01 and in the HBS 2007. The analysis shows that in 2000/01, the share of the poorest quintiles in publicly-funded health services was less than 2%, while that of the richest quintiles was around 25% (Table 5). The most obvious explanation for the little share of the poorest quintiles in publicly-funded health services could be the fact that the poorest people sought health services from missionary hospitals, dispensaries, and health centres. This is evidenced in the HBS 2000/01 in which the percentage of people seeking health services from missionary health institutions were 65.5%, compared to 35.5% for those who sought the services from public health centres.

However, using the HBS 2007, the share of the poorest quintiles was significantly increasing from less than 2% during 2000/01 to around 20% in 2007. The share of the richest quintiles decreased from around 24% to 18% during the HBS 2007. This could be explained by the fact that more rich people resort to health services from private hospitals. The share and rate of participation are summarized in Table 5:

Table 5: Share by Quintile Groups in HBS 2000/01 and HBS 2007

Groups	HBS 2000/01			HBS 2007		
	Disps.	*Hospitals*	*H/Centres*	*Disps.*	*Hospitals*	*H/Centres*
Poorest	0.027	0.001	0.004	0.210	0.208	0.204
Poor	0.238	0.272	0.237	0.205	0.198	0.195
Average	0.258	0.278	0.267	0.197	0.211	0.205
Rich	0.236	0.201	0.241	0.200	0.195	0.189
Richest	0.241	0.247	0.251	0.188	0.188	0.208

Note: Disps. = Dispensaries, H/Centres = Health Centres

Source: Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

Analysis by Rate of Participation

An analysis by the rate of participation both in the HBS 2000/01 and in HBS 2007 gives mixed results. While in the HBS 2000/01 a majority of the quintiles participated more in public dispensaries than in the HBS 2007, a majority of the households participated in health centres (Table 6). However, the divide between the richest and the poorest quintiles in the participation is not very clear. It is interesting to note that the rate of participation in the services of public hospitals, as well as health centres by the poorest quintiles increased rapidly between the HBS 2000/01 and HBS 2007.

Table 6: Rate of Participation by Quintile Groups in HBS 2000/01 and HBS 2007

Groups	HBS 2000/01			HBS 2007		
	Disps.	***Hospitals***	***H/Centres***	***Disps.***	***Hospitals***	***H/Centres***
Poorest	0.005	0.000	0.000	0.033	0.033	0.036
Poor	0.042	0.009	0.011	0.032	0.031	0.034
Average	0.046	0.009	0.012	0.031	0.033	0.036
Rich	0.042	0.006	0.011	0.031	0.031	0.033
Richest	0.043	0.008	0.011	0.029	0.029	0.036
All	**0.036**	**0.006**	**0.009**	**0.031**	**0.031**	**0.035**

Note: Disps. = Dispensaries, H/Centres = Health Centres

Source: Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

Analysis by Groups

The HBS 2007 was used to analyse the benefit incidence in the health sector across rural-urban divide and across gender. The results show that about 57% of the rural population used health services in dispensaries and hospitals compared to 42% in urban areas. Services in health centres were shared by only 24% of the rural population, while 75% of the urban population shared similar services. The rate of participation on the rural-urban divide also shows that a majority of the rural population participated in health services in dispensaries and hospitals, while on the other hand, the urban group participated more in health services offered by public health centres.

On the gender divide, about 55% of the female population shared services from public health sector offered in dispensaries, hospitals, and health centres; compared to about 45% of the male group. The rate of participation on the gender divide was also high for the female group. This could be justified by the role of women in vaccination, pre- and post-natal consultation, and other maternal and child health related services. The findings are summarized in Table 7.

Table 7: Benefits Incidence Analysis across Location and Gender HBS 2007

Category	Shares				Rate of Participation			
	Urban	***Rural***	***Male***	***Female***	***Urban***	***Rural***	***Male***	***Female***
Dispensaries	0.427	0.573	0.452	0.548	0.021	0.049	0.029	0.033
Hospitals	0.427	0.573	0.452	0.548	0.021	0.049	0.029	0.033
Health Centres	0.752	0.248	0.436	0.564	0.041	0.024	0.031	0.039

Source: Author's Calculation using Distributive Analysis Stata Package (DASP) 2.1

Using rural-urban divide as well as the gender divide, the HBS 2000/01 could not give meaningful results; thus, it was not included.

Progressivity Benefit of Public Spending in the Education Sector

The Gini and the concentrations coefficients for the HBS 2000/01 in Table 8 show that public spending in primary and secondary education was not progressive in absolute terms, indicating that it was not pro-poor. In other words, public spending on education in Tanzania can be said to be progressive in relative terms, but regressive in absolute terms. This reinforces our findings on the BIA of the education sector. The fact that social spending in education was regressive in absolute terms implies that the poorest group (20%)got less than 20% of the benefits of public spending in all public social spending in education.

Table 8: Gini and Concentration Indices for Education Spending in Tanzania

	HBS 2000/01			HBS 2007		
	Gini	***Concentration***	***Difference***	***Gini***	***Concentration***	***Difference***
Primary	0.2256	0.0016	-0.224	0.8194	-0.5745	-1.3939
Secondary	0.0988	0.0333	-0.0655	0.9027	-0.6912	-0.0655
Tertiary	0.0058	-0.0044	-0.0102	0.5923	-0.0091	-0.0102

Source: Author's Computation based on HBS 2000/01 and HBS 2007 using DASP 2.1

For the HBS 2007, the concentration indices were negative; indicating that the spending in the sector was progressive in absolute sense, and hence pro-poor. This finding was comparable with evidence of public spending on education in other studies. Chu et al. (2000) and Killick (2002) found that public spending on education and health was progressive but poorly targeted, and that it was not pro-poor. In a pro-poor spending arrangement, 20% of poor quintiles were expected to receive more than 20% of the benefit accrued from such spending. Therefore, the proportion of the benefit accrued to the poor from public spending was more than the proportion of the tax they paid into the funding of the benefit.

Marginal Benefit Incidence Results

The analysis above shows how education was distributed across the population using the observed government spending on public schools in Tanzania. It describes the current situation; hence it may not give an accurate notion on how changes in the education and health budget would be distributed across the quintiles. This calls for the marginal benefit incidence analysis (MBIA). The result of the marginal incidence analysis on public spending in education in Tanzania is presented in Table 9 for the HBS 2000/01. The result suggests that the poorest group would benefit more than the richest group in the expansion of primary schooling, while the middle-income group would benefit more than the poorest in the expansion of secondary school education in Tanzania. Many children from the poorest group attend public primary schools in Tanzania, whereas most of those attending private schools in Tanzania are from the richest quintiles group. Following PADEP, primary education in Tanzania was free for all children. This allows most of the children from the poorest group to access it if there is an expansion.

Table 9: Marginal Benefit Incidence of Social Public Spending in Tanzania

Social Spending	Household Budget Survey 2000/01					Rate of Participation by Poorest Quintile in percentage
	Poorest	*Poor*	*Average*	*Rich*	*Richest*	
Primary	13.47	-2.67	-1.98	-3.25	-0.57	13
Secondary	0.86	0.83	1.44	0.89	0.97	0.8
Tertiary	0.94	1.03	0.36	0.75	1.90	0.9

Source: Author's Estimate from the HBS 2000/01 data

We note that the middle income group would benefit from the expansion of secondary education in Tanzania given that, even with the expansion of secondary education through the Secondary Education Development Programme (SEDP), school-age children from the richest quintiles may continue in their private secondary education, and thus the middle income group may take the advantage of the expanded secondary education opportunities, and therefore benefit more than the poorest group in the expansion. The poorest quintile lags behind due to the fact that from the free primary education, they were faced with tuition fees in public secondary schools. Tertiary education continues to benefit the richest and middle-income quintiles than the poorest quintiles. These could take the advantage of the ability to attend secondary education, with the richest quintiles being more advantageous with education from the best private secondary schools where individuals from the poorest quintiles could not afford.

Thus, our estimates show that the poorest Tanzanians are likely to benefit even more than at present from an increment in primary school spending. From the perspective of the poorest, therefore, it makes sense to continue the public effort in providing free education at the primary levels, and to address challenges facing the poorest quintiles from accessing secondary and tertiary education. The richest quintile is more likely to benefit from increased spending on secondary and tertiary education. This coincides with our analysis on the BIA above.

There were several general impressions about the MBIA in public spending in education in Tanzania, which are worth mentioning. Firstly, when the distribution benefit in a sector where the average participation rate is high, the poor tend to benefit more from the extra government spending. So, initially the accessibility rate to social utility may determine whether the poor would benefit more or not from the expansion of that social utility. Secondly, the higher the difference in the participation rates between the richest and poorest groups, the higher the tendency that increases in public spending in the social utility would benefit the poorest more than the richest. This is evidenced in the participation rate of the poor.

Policy Recommendations

There are several policy recommendations that we can make out of this study. First, there is a need for pro-poor policies to accelerate the speed at which the poor benefit more from increases in the access to social utilities in Tanzania. Equity concerns should always be at the centre of financing strategies to reach disadvantaged groups.

Secondly, from the perspective of the poorest and the poor, it make sense to continue the public efforts in providing free education both in primary and secondary education to expedite the success of the national strategy for growth and poverty reduction. Thirdly, the government should put more effort in addressing the constraints that prevent poor households from accessing tertiary education in respect to cost-sharing, education background, and loan disbursements. There must be an effort to ensure that the gains in primary school enrolments are not lost. The poor quality of education and the failure to improve education attainment at primary levels eventually discourages school attendance and progress to higher levels for the poor group. Fourthly, rural areas and the female group need more attention to expand accessibilities to these social services. Lastly, increases in budget allocations must be accompanied by increased enrolment by poor households. Therefore, issues that prevent the poor from accessing educational services must also be addressed.

Conclusion

The average benefits analysis on the education sector in Tanzania shows that the poorest quintiles had significant shares in primary and secondary education compared to the rich. The richest quintiles dominated tertiary education. Regarding the rate of participation, the findings show that the rate of participation was highest in the primary education sector at all levels. The analysis by groups shows that participation by group was the highest for the urban and male groups, while the urban group shared most of the benefit of increased spending; with the rural and female groups lagging behind.

The average benefit analysis on the health sector was done using the frequency approach method. The findings show that there were more female population who shared public health services (at the rate of around 55%) than the male population. Most of the rural population shared health services from dispensaries, while the urban group shared services from health centres. In general, there was an increased share of the poorest quintiles of health facilities between the two periods (i.e., HBS 2000/01 and HBS 2007).

Using the HBS 2000/01, the findings on the progressivity of benefits in the education sector shows that public spending in education was not progressive in absolute terms. The poorest got less than 20% of the benefits. The findings on the progressivity of benefits using the HBS 2007 were different from the HBS 2000/01. This reveals that, public spending on education was progressive in absolute sense, hence pro-poor. These findings are well complemented by the concentration curves. The marginal benefit analysis shows that the poorest and the poor are likely to benefit even more than at present from an increment in primary school spending. The richest quintiles are more likely to benefit from increased spending on secondary and tertiary education. On the other hand, the middle-income group would benefit more from increased spending on secondary education. This is because the poorest have already high access on primary education, the middle income on secondary education, and the richest on tertiary education.

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