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INCREASING ACCESS AND REDUCING OPERATIONAL UNIT COST IN PUBLIC SECONDARY SCHOOLS IN EDO SATE, NIGERIA

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Abstract

The problem of increasing financial burden of education in the face of other pressing macroeconomic needs poses serious challenges to educational development in Nigeria. Moreover, there is an increasing demand for education at a time when government revenues are dwindling. This problem is compounded by the inefficient use of available resources in schools. This has resulted in a high cost of public school operation. This has necessitated the need to explore alternative means of improving control over the cost of education and increase access to public schools. This study, therefore, investigated the influence of a number of size factors (enrolment, average class size and student-teacher ratio) on the operational unit cost of public secondary schools in Edo State, Nigeria. The study adopted the descriptive survey research design of ex-post facto type. Multistage sampling techniques were used to select 207 out of the total of 509 conventional public secondary schools across the three senatorial districts of Edo State. Two inventories were used to generate secondary data from the selected schools and two State Ministry of Education officials. The school inventory was used to obtain data on individual school size features and recurrent expenditures while the inventory for Ministry of Education was used to collect aggregate school enrolment, classes, staff and recurrent expenditures in the state during the research period. Three research questions were answered and data analysed using descriptive statistics. The results showed that increasing the various size factors invariably reduced the operational unit cost of schooling and hence, generated monetary savings for the school system in the state. Notably, the result indicated that the reduction in unit cost is not linear, implying that cost reduced at a declining rate. Therefore, enrolment, average class size and student-teacher ratio could be increased to a permissible level as a cost reduction strategy in public schools.

Keywords: Enrolment, Average class size, Student-teacher ratio, Recurrent unit cost.

Note: The authors with yellow colour are not in the reference list. All the authors in the reference list with green colour were not used in the body of the work

Introduction

Following the 1990 world conference on Education for All (EFA) in Jomtien, Thailand, many developing countries including Nigeria, became signatories to a commitment to among other agreements, ensure universal access to, and completion of primary education by the year 2000 (World Bank, 1999). In response to this commitment, Nigeria launched the Universal Basic Education (UBE) programme in 1999. Since then, the total number of primary school enrolment has grown, fuelled by grants and substantial domestic allocation of resources. For instance, in 2000, the total number of primary schools and pupils' enrolment in Nigeria stood at 49,326 and 19,073,967 respectively. In 2003, the total number of primary schools and pupils in enrolment had reached 59,731 and 25,972,044 respectively before the pupils' number decreased to 23,017,124 and number of schools fell to 54,438 in 2006 (Federal Ministry of Education [FME], 2007; National Bureau of Statistics [NBS] 2007).

Notably, little attention was paid at the conference to the consequences of enrolment expansion in relation to the resources needed for secondary schools. This created the problem of access to the secondary education system in the country. According to the Federal Republic of Nigeria [FRN] (2004), the Nigerian government desired to provide increased access to secondary education for the increasing number of primary school leavers. This is because the rate of enrolment is now being used universally as an index for measuring the level of educational development of nations (World Bank, 2006; Lewin, 2001).

Consequently, a number of public secondary schools were established even in sparsely populated areas with comparatively few students per school. Many small-sized and under-enrolled secondary schools were floated in places including villages as an effort by government to provide increased access to all eligible primary school leavers (Afolabi, 2001; Bray, 1994). For instance, the number of secondary schools in the country increased from 6,001 in 1990 to 6,452 in 1995; 8,276 in 2000 and 18,338 in 2006 (NBS, 2007; Uwatt, 2003; Olaniyi & Adam, 2003). Enrolment at the national level per school averaged 559 in 1992; 732 and 765 in 1995 and 1996 respectively (Olaniyi & Adam, 2003).

In Edo State, the total number of secondary schools increased from 293 in 2000 to 652 in 2003 and 918 in 2006 (FME, 2007; NBS, 2007). The average enrolment per school in the state declined from 1034 in 1999 to 871 in 2000; 410 in 2003 and 163 in 2006 (NBS, 2007; Ministry of Education [MoE], Edo State, 2007). Similarly, average class size (ACS) and

student-teacher ratio (STR) in the state declined from 73 and 35:1 in 1999 to 9 and 27:1 in 2003 respectively. In 2006, the ACS was 38 while the STR stood at 28:1 (NBS, 2007; FME, 2007). The argument for reduced school sizes is usually based on the quality value of small school sizes. Proponents of small school sizes opined they (Enrolment, ACS, and STR) will improve teacher-student interaction and that teachers will be able to pay personal attention to students' needs (Cotton, 1996; Donogue, 1971). Observably, different countries have different priorities for increasing or reducing sizes of schools. For instance, South Korea encourages higher class size to sustain the payment of high salaries to their teachers (Lewin, 2001). Moreover, studies have shown that smaller sizes do not guarantee that students get better attention in schools (Turstel, 2006; Hanushek, 1998; Carnoy, 1999). For instance, Turstel (2006), noted that the STR in Organisation of Economic Cooperation and Development (OECD) countries dropped from 24:1 in the 1960s to 17:1 in 1990s (a drop of about 28%), yet the Scholastic Aptitude Test (SAT) conducted in these countries showed that performance dropped from 954 to 890, indicating a loss of 58 points or six per cent.

Efforts by government to maintain reduced school sizes could mean building additional schools, employing more teaching and non-teaching personnel, providing additional school resources/facilities or equipment, as well as maintaining the school plants in order to ensure effective service delivery. All of these have implication for cost on the government and tax payers and hence, an overall increase in government's total expenditure (Adedeji, Olaniyan & Owoeye, 2001). Thus, the problem of increasing access to secondary education vis-à-vis the increasing cost of providing the needed secondary education has become twin challenges to sustainable educational development. For instance, in 1975, the total recurrent expenditure on secondary education stood at N218.9m; N3, 406m in 1990 and N39, 034.00m in 2000 (Adenuga, 2003). Similarly, in Edo State, the total recurrent expenditure on secondary education was N2,017.2m in 2001; N2,353.5m in 2003, N3,501.1m in 2006 and N5,027.07m in 2007 (Edo State Directory of Public Secondary Education, 2005 and Edo State Ministry of Education, 2007).

The concern for the increasing cost of education has been heightened by the spate of complaints about the operational cost of schooling. Government complained of the increasing financial burden of education and the inefficient use of available resources in schools in the face of other pressing macroeconomic needs (Babalola, 2001; Psacharopoulos & Woodhall, 1985). The increasing financial burden of education resulted in comparatively dwindling financial support for education by the government. The problem was complicated by the relatively declining government income due to the unstable global economic climate. This has made the continued expansion of secondary education unsustainable. The question, therefore, is how to reduce the operational costs of schooling while providing the needed access to all eligible secondary school-age population. Research has shown that one of the alternative ways of doing this is by

exploring the concept of economies of size (Babalola, 2001; Mingat & Tan, 1988; Coombs & Hallak, 1987; Psacharopaulos & Woodhall, 1985).

According to Mingat and Tan (1988), economies of size (scale) exist in the production of students when the average cost of production declines as the quantity produced increases or equivalently, when the marginal cost of production are lower than the average cost. When cost moves in the opposite direction, there are diseconomies of scale (Babalola, 2001). This suggests that expanding enrolment could reduce unit cost and provide increased learning opportunity to more young people within the school age (Wu, 1999). The benefit of economies of scale (EOS) is that it will lead to a reduction in the average cost of schooling and consequently guarantee increased opportunity for access to secondary education. Notably, there are conflicting results on the cost-size relationship in school operation, while some researches show that larger school size impacts more positively on the operational cost (Afolabi, 2001; Psacharopoulos & Woodhall, 1985; Babalola, Okunola, Ibekwe & Adeyemi, 1996). Others believe that per-pupil costs are lowest in smaller schools (Cotton, 1996; Gladden, 1989).

The problem of insufficient and sometimes declining funding of public schools is often compounded by the inefficient use of available resources. As the state government continues to shoulder an increasing share of the financing of secondary education in the face of other competing pressing public needs such as health, agriculture and infrastructural development, there is a heavy financial burden of education on the government. This increased burden has implication access, resource availability, quality and overall educational development. Thus, improving efficiency through maximum utilisation of available resources in schools is imperative as this could save significant amount of scarce resources. This study, therefore, investigated the influence of school size factors on the operational unit cost of public secondary schools in Edo State, to provide modalities on how an increased secondary education opportunity can be enhanced for all eligible children transiting from primary to secondary schools in Edo State, Nigeria.

Research questions

The following research questions guided this study

1. What is the effect of enrolment size factor on recurrent unit cost in the sampled public secondary schools?
2. What is the effect of increased class size on recurrent unit cost in the sampled public secondary schools?
3. To what extent will the size of the student-teacher ratio influence the recurrent unit cost of public secondary education in the sampled schools?

Scope of the Study

The study focused mainly on the conventional public secondary schools (Junior and Senior) in Edo State, Nigeria, mainly financed from the government's annual budgets and also constituted larger proportion of the total number of secondary schools. Cost consideration was limited to recurrent cost from which we derived the per-pupil recurrent cost. It does not include the calculation of capital cost since capital expenditure is usually spread over a long period and as such become insignificant in the long-term. The elements of school size in the study include enrolment (also referred to as the average school size), the average class size (ACS) and the student-teacher ratio (STR).

Methodology

Research design

The study was a descriptive survey type.

Population

The population consisted of 509 conventional public secondary schools (junior and senior), spread across the three senatorial districts of Edo State, Nigeria.

Sampling technique and sample

Multistage sampling technique was used in the study. Using the stratified and random sampling techniques, 207 or 40 per cent of the school heads (principals) were selected as respondents to one of the inventory formats designed by the researcher. The second instrument was used to collect secondary data from the State Ministry of Education.

Data Analysis

Descriptive statistics was used to analyse the data obtained from the schools.

Study Area

The study was conducted in Edo State, situated in the South-South oil producing region of Nigeria. Its administrative capital is Benin-city. The state has a total population of 3,218,332 million people with 13 different languages spoken (NBS, 2010). The state has three senatorial districts comprising Edo central, north and south. The annual mean rainfall and temperature is 196.5.

The rationale for choosing the state was that related studies in this area were scarce. Moreover, the researchers' personal interest and knowledge of the area in terms of easy access which allowed for easy and quick participation among the respondents informed this research.

Method of data collection

Field assistants were hired and trained by the researcher to assist in the distribution and collection of the instrument from the respective schools.

Results

The results of the data obtained and analysed in line with the questions raised are as presented as follows:

Q1: What is the effect of enrolment size factor on recurrent unit cost in the sampled public secondary schools?

Table 1: Size structure of enrolment and recurrent nit cost in the sampled secondary schools

Enrolment	No. of Samples	Standard Deviation	Rec. Unit Cost (N)
≤ 200	56	17837.06608	40,031.86
201 – 400	101	10350.69972	24,413.24
401 – 600	27	6199.24924	16,885.88
Above 600	16	2065.05271	12,913.56
Total	200	15103.38161	26,850.28

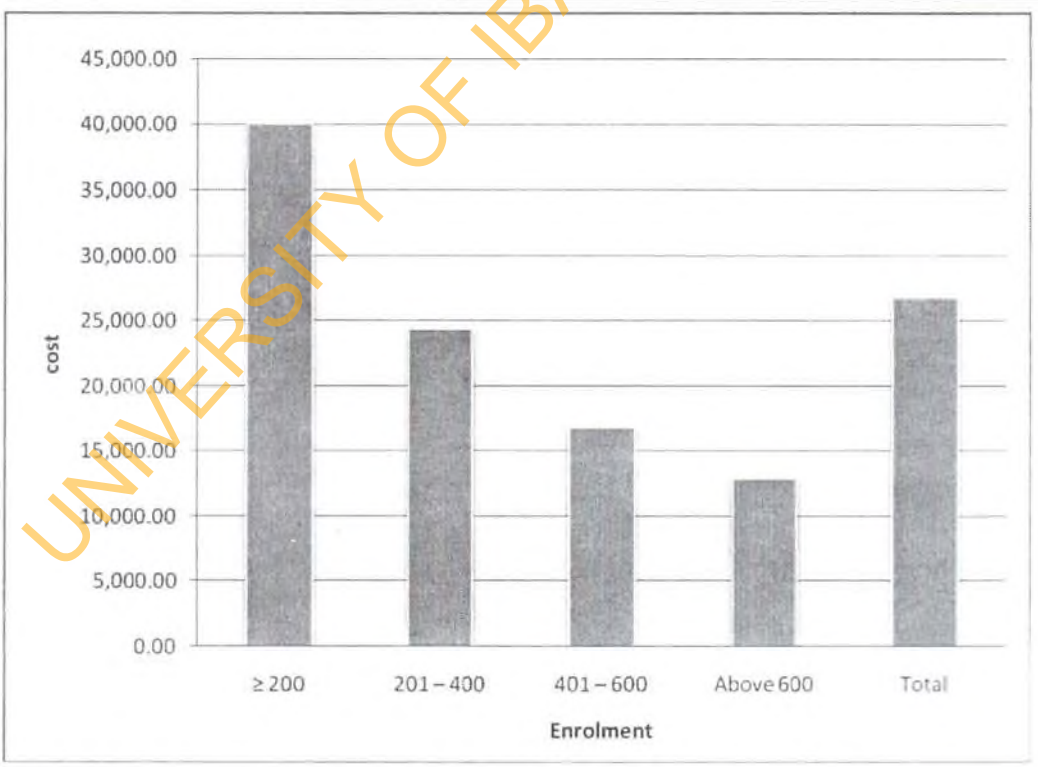

Fig 1: Relative response of recurrent unit cost to enrolment growth in ublic secondary schools in Edo State

Table 1 shows that as the average enrolment increased from less than 200 students to between 201 and 400 students, unit cost fell from N40, 031.28 to N24, 413.24. Thus, about N15, 618 was saved as enrolment increased from about 200 pupils per school to about 400. Similarly, as the enrolment increased from between 201 and 400 students to between 400 and 600 students per school, unit cost also declined from N24, 413.24 to N16, 885 respectively. It further fell to N12, 913.56 as the enrolment increased from between 400 and 600 to above 600 students per school.

Q2: What is the effect of increased class size on recurrent unit cost in the sampled public secondary schools?

Table 2: Structure of average class size (ACS) and recurrent unit cost in the sampled public schools

ACS	No. of Schools	Standard Deviation	Rec. Unit Cost (N)
≤ 20	27	19798.30701	43,456.28
21 – 30	86	13629.24890	28,446.15
31 – 40	39	9783.24890	21,953.61
41 – 50	24	8094.78798	17,282.81
Above 50	24	10128.20998	19,996.11

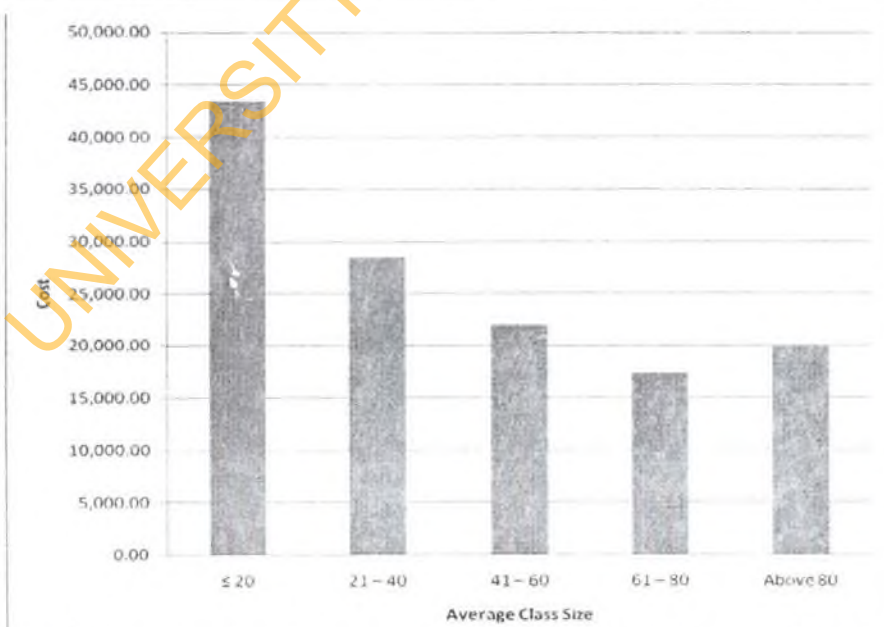

Fig 2: Relationship of unit cost to growth in ACS in the sampled schools.

The results in Table 2 show that as the ACS increased from below 20 students to between 21 to 30 students per class, the average cost decreased from N43, 456.28 to N28, 440.15 respectively. It further declined to N21, 956.61 as the ACS increased from between 31 and 40 students.

Q3: To what extent will the size of the STR influence the recurrent unit cost of public secondary education in the sampled schools?

Table 3: Relative response of unit cost to increase in the student-teacher ratio (STR) in the sampled schools

Table 3: Relative response of unit cost to increase in the student-teacher ratio (STR) in the sampled schools

STR	No. of Schools	Standard Deviation	Rec. Unit Cost (N)
Up to 20	64	1891.36881	36,347.40
21 – 40	100	11038.59179	23,568.32
41 – 60	22	6839.03985	20,533.67
Above 60	14	7831.36301	16,803.57

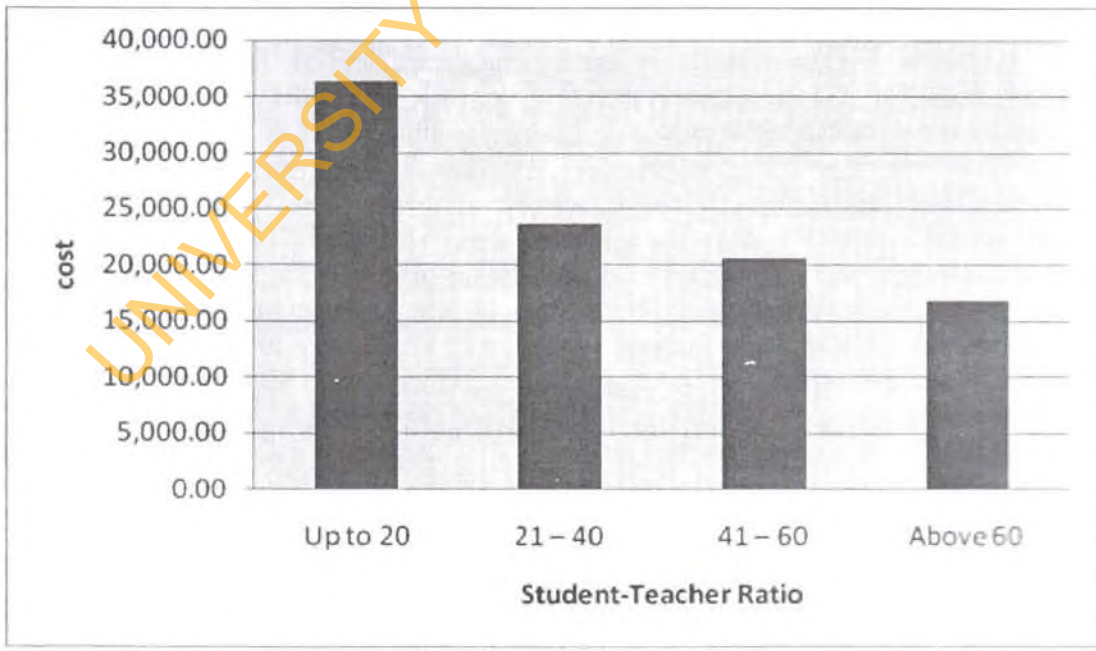

Fig 3: Movement of unit cost to increases in STR in the sampled public secondary schools

Table 3 shows that unit cost declines with increases in the STR. For instance, with a STR of 20:1, the average unit cost was N36, 347.40 but it reduced to N23, 568.67 as the STR increased to between 21 to 40 students per teacher, representing a decrease of about N13, 813.40 or 36.4 per cent. A further increase in the STR from about 40 to 60 students per teacher reduces the average cost per student from N23, 568.32 to N20, 533.67 representing a decrease in unit cost by 17.0 per cent. Similarly, as the STR increases from beyond 60 students per teacher, the average expenditure per student again declined from N20, 533.67 to N16, 803.57 representing about 18.0 per cent decrease in unit cost.

Discussion

The enrolment distribution shows that a greater number of schools sampled had an average enrolment of between 200 and 400 students. A total of 101 (50.5 per cent) of the entire 200 schools sampled fall within this size category. Out of this, 72 (55.4 per cent) and 29 (41.4 per cent) of the schools were in the rural and urban locations respectively. The result indicates that about 27 (13.5 per cent) of the total number of schools sampled had enrolment of between 400 and 600 students per school at the aggregate sample, while only 8.0 per cent of the sampled schools had enrolment beyond 600 students on the average. The result shows that the mean enrolment in the state schools was 336 students per school. The result is a little above Meier (1995) who calls for schools not beyond 300 students but is below Goodlad (1994) who suggests enrolment between 500 and 600 students, Williams (1990), 400 and 800 and Fox (1981) between 1000 and 2000 students.

The distribution of enrolment pattern has implication for cost structure in education. There are greater unit cost burdens on schools with fewer students than those with larger enrolment Most of the rural schools are usually small sized, and are likely to incur greater unit operational cost than the larger schools. For instance, the results indicate that schools with student population of 200 or less had a higher unit cost N40, 031.86. But as the enrolment increased from between 201 and 400 students on the average, the unit cost fell to N24, 413.24 representing a decline of about 40 per cent, or a savings of N15, 618.62. Similarly, as the enrolment size increased from between 401 and 600 per school, the unit cost declined in response to the increase in enrolment from N24, 413.24 to N16, 885.86 representing a unit cost reduction of N7, 527.36 or 30.8 per cent. In the same vein, the unit cost declined to N12, 913.56, a difference of N3, 972.32. Thus, a substantial amount of money can be saved in schools as the size of enrolment increases. This implies that there is a certain economy associated with increase in school enrolment. However, the fact that the unit cost falls at a declining rate indicates that there is a non-linear relationship between enrolment and unit cost. For instance, the unit cost initially declined by N15,618, then it declined by N7,499 and then it further declined by N3,972 even as the enrolment increases. Thus, it is possible for the unit cost to decline with additional enrolment and subsequently to rise with further increases.

The findings of the study are similar to that of Oxburn (1994), that schools with 500 students had a unit cost of US$12.74 less than schools with 200 students and a

corresponding reduction of US$16.74 in schools with 1000 students, US$11.14 in schools with 1,500 pupils, US$5.33 in schools with 2,000 students and US$0.66 in schools above 2,000 students. Thus, as the enrolment increases, the financial gain gradually reduces. Moreover, Riew (1986) found that expenditure per pupil in certain American schools declined fairly steadily from US$531 to US$374 as enrolment rose from below 200 to between 701 and 900 students per school. They however rose to US$433 in the next size category 901 and 1,100, accompanied by a rise in the provision of teachers with higher qualifications. Owing to this accompanying factor, Riew (op.cit) pointed out that larger schools were still providing value for money.

The enrolment structure of the public secondary schools in the state suggests the existence of economies of scale. This is similar to the findings of Oguntoye (1999), who equally noted the existence of economies of scale in Ogun State public secondary schools. It is evident that it is possible to increase the enrolment in the state public secondary schools to 600 students per school until a threshold is reached where additional increase would increase the unit cost beyond the preceding one. Going by the result of an average enrolment of 336 students per school on the aggregate, it is clear that there are potentials for increasing enrolment in the state public secondary schools. If schools are left under-enrolled, particularly those in the rural areas, such schools are most likely to face the problem of increased unit cost and hence, increase the inefficiency in resource utilization in the system.

The mean ACS for the sampled schools in the state stood at 45 while it is possible to increase the ACS to 50 students per class. A considerable benefit could arise from having larger class size for access and participation. Studies have shown that with larger ACS of 50 and beyond, South Korean and Japanese secondary schools were adjudged among the best in the 1994 and 1995 IEA Third International Mathematics and Science Study in the world (Calloids & Lewin, 2001). This underscores one of the needs for an increased ACS in the state public secondary schools.In relating the per-pupil expenditure to the ACS in the sampled distribution, we observed that an ACS of at most 20 students per class will have a unit cost of N43, 456.28 on the average. Unit cost per student falls to N28, 446.15 as ACS increased from between 21 and 40. They represent a decrease in unit cost by N15. 010.13. As the ACS increased to between 41 and 60 students per class, a savings of N6. 492.25 was gained. It was noticed that greater savings was realised when ACS increased from between 20 and 40 than from 40 and 60. However, it is rational and more profitable to increase ACS beyond 40 pupils or even 50 since the expected savings is still positive. This is consistent with the work of Farrell and Steifelbein (in Calloids and Lewin, 2001) who noted that a 15 per cent increase in the ACS of Chile's public secondary schools would reduce the annual educational budgets by five per cent. This position also corroborated the works of Abagi and Odipo (1999). The authors found that savings are made from increasing the use of classrooms in Kenya's public primary schools. They then argue that such savings could be put back into the system to improve its efficiency. This

implies that it is possible to achieve additional access to education without necessarily increasing the cost of such expansion.

The distribution of the STR shows that 32.0 per cent of sampled schools have a STR of 20:1 with little or no mean difference between urban and rural schools. The aggregate mean ratio stood at 30:5. The very low STR has implication both for access and cost. A higher STR will mean more students to a teacher and vice-versa. The STR size indicator shows that educational advancement is linked with a higher STR. Similarly, a higher STR will suggest greater number of students per teacher's expenditure. For instance, a STR of 20:1 in this study connotes a unit cost of N36, 347.40. But as the STR increased to about 40:1, the per pupil expenditure dropped to N23, 568.32. Changes in increased teachers' utilisation in schools is desirable and could be achieved by increasing the STR. Thus, increasing the STR factor in schools is an essential element in making secondary education affordable. Although the national norm stipulates a STR of about 40:1 (FME, 2007), it is important to consider the additional cost of providing additional qualified teachers and other didactic resources to maintain a low STR. This is more so, when we consider the financial limitation on the part of government as reflected in the comparatively declining funding of education. Since government is the major financier of public secondary education, it is important to increase the STR to the appropriate level in order to provide increased opportunity for all eligible school age population.

Calloids and Lewin (2001) contend that the STR factor is more likely to have cost-reduction effect on schools because of teachers' salary cost as against other school size factors. Teachers' salary cost constitutes the highest recurrent cost determinant in secondary education (Akangbou, 1987; Ajayi, 1998; Ajayi, 2004; Abagi & Odipo, 1997). Hence, increasing the STR factor would lead to a reduction in the average operational cost burden on government and consequently provide greater opportunity of access to all eligible school-age children. In line with the result, Calloids and Lewin (2001) suggested that by increasing the STR in public schools, more graduates will not only be produced at cheaper cost, but more savings could be made. In the same vein, Abagi and Odipo (1999) noted that Kenya's Ministry of Education would have saved an estimated Ksh3.5 million if the pupil-teacher ratio in public primary schools was increased to 40:1 from its current 30:1.

Conclusion

One important way of cost recovery in public secondary schools would be to increase the school size to the permissible and acceptable limit, capable of generating savings that could compensate for the limited government budget. This implies that a higher level of access to secondary education can be achieved through increasing school sizes. The savings generated from this could be ploughed back to improve the overall quality and quantity of secondary education delivery. It is important to note that the number of

students in schools is now being used by many countries as an index for measuring the level of educational development. Therefore, efforts must be made to fully tap the potential for increasing access to the school age children population through an effective and efficient utilisation of available resources. Rather than building new schools that could further strain the limited resources and increase the cost burden on government, it is economical to increase the size of schools. This can be achieved by merging small sized inefficient schools to optimum enrolment level to reap the benefits of economies of scale. Thus, margining of small sized schools could be a useful policy option for reducing unit cost in public schools since most of the schools are operating at sub-optimum level. The argument is that it is possible to teach more students more efficiently or at lower unit cost. Nonetheless, it is important to define the limit of increasing size within the optimum and appropriate scale so that schools will not begin to face the problem of diseconomies. It seems plausible to improve the recurrent unit cost if students in schools with overcrowded facilities are redeployed to schools with few students and underutilised facilities. This will help as a policy option in reducing the need to invest in new facilities and employing additional personnel. There is need therefore to consider the advantage of greater economic efficiency in the face of uncertain financial conditions facing the government. A marginal improvement in schools' efficiency could save significant resources, given the size of expenditure on education.

Recommendations

The findings have implication for policy and practice in the field of educational management. In view of this, the following recommendations are made:

- Adequate knowledge about the relationship between average cost of schooling and school expansion is pertinent. This can usefully guide management and/or government policy decisions about enrolment growth and the number of additional schools that may be required to serve students at the lowest possible cost.

- The government should as a cost reduction strategy embark on adequate utilisation of physical resources through maximum use of students' space in schools. An increase in size factors highlighted in this study would lead to a decrease in the cost of schooling and thus, a sizeable amount of money is saved.

- Small sized public schools located within the same geographical area should be merged to reduce the cost of school operation by government. This suggestion is based on the result that smaller schools are more expensive to manage because they tend to have a high unit cost of production. Savings that are generated from such merger can be ploughed back into the merged schools to improve both the quality and quantity of school output. Appropriately, the benefit of such merger should be weighed against the cost of transferring students to the new schools and that of building new schools.

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