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Differential Enrolment and Operational Cost of Public Secondary Schools in Urban and Rural Edo State, Nigeria

By

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Abstract

This study therefore investigated the differential enrolment and recurrent unit cost of public secondary schools in urban and rural Edo state, Nigeria. The study adopted the descriptive research design of the survey type. The population for the study consisted of all the principals in all the 540 public secondary schools in Edo state. Two hundred and sixteen (216) or 40% of the schools and principals were selected using stratified and simple random sampling techniques. An inventory on school enrolment and operational expenditure was used to obtain relevant information from the individual schools. Two hundred (200) or 92.5% of the instrument were returned. The t-statistics analytical tool was used to test the two hypotheses while quadratic equation regression model was used to show the curvilinear relationship between school enrolment and unit cost in the sampled schools. The hypotheses were tested at 5% level of significance. Result of the study showed that there were significant differences in recurrent unit cost ($t= 2.078; p<0.05$) and enrolment ($t= 4.48; p<0.05$) respectively between urban and rural schools in the state. The relationship between expanding enrolment and recurrent unit cost was U-shaped. Policy towards improving enrolment in rural schools was therefore recommended as a technique for reducing the operational cost of schools.

Introduction

In a constantly dynamic socio-economic system, available (but limited) resources are usually reallocated in response to the value placed by consumers on the various services provided by the society. In Nigeria, as the demand for secondary school enrolment increases, government had made effort to provide secondary school opportunity to all eligible school-age children. This had led to the establishment of secondary schools even in sparsely populated areas with comparatively few students. Thus, many small-sized and under-enrolled public secondary schools are located in many places (including villages) in an effort by government to provide increased access to the increasing number of primary school leavers (Isuku, 2011). For instance, the number of secondary schools in Nigeria increased from 10,913 in 2005 to 18,238 in 2008 (National Bureau of Statistics NBS,2009) while the enrolment equally increased from 6,397,343 to 6,625,943 during the same period (NBS, 2009). In Edo State, the number of secondary schools increased from 540 in 2005 to 918 in 2008 while students enrolment ironically declined from 176,172 to 173,908 during the period under review (NBS, 2009). Increase in the number of schools would necessitate additional resource inputs. Thus, the growth in the number of secondary schools undoubtedly has implication for increased expenditure for the government as schools are built in urban area with higher population and in remote/rural areas with apparently little population.

However, the specter of global recession and other macroeconomic problems facing the country imposes

serious challenges to educational investment particularly at the secondary school level. Some studies have shown that the location and enrolment size of schools have implication for cost and efficiency. For instance, in most rurally located schools, it is estimated that cost per student is more complex because students are usually few both on the average and at the classes and the pupil/students-teacher-ratios are lower in most of such schools than the schools in urban centers (Sheyin 2000; Bray, 1998; Abagi and Odipo, 1997; Coombs and Hallak, 1987). Coombs and Hallak (1987) for instance, resonates that small village schools had abnormally high cost per student because the student-teacher ratio is so small. They remarked that a number of countries have therefore consolidated such small-sized schools, thereby reducing per students cost and at the same time, enriching and strengthening the curriculum and achieving better learning results. A case in point was Guinea which established minimum norms for the size of rural schools with the aim of phasing out some 500 "undersized" and "unprofitable" rural schools by 1984/85.

In the Nigeria context, there are indications that most public schools, particularly those located in rural areas, still face the problem of under enrolment and hence, the possibility of increasing the cost and inefficiency of the secondary school system. Afolabi (2001) observed that there is proliferation of under-enrolled secondary schools in Nigeria which had led to mere wastage of the available meager resources. Afolabi lamented a scenario where a particular public school had five (5) home economics teachers for eighteen (18) home economics students in a particular state. He then remarked that such situation was unprofitable and inefficient for schools, governments and stakeholders in the business of education services. Similarly, Ebong and Agabi (1999), found that there were wastages in secondary schools where teachers taught classes of small sizes in Cross River State. Unfortunately, the distribution of school resources is usually a function of school location in most cases. For instance, Adedeji (2001) found that schools located in cities and urban areas are usually more staffed with quality teachers and even in larger quantity than the schools located in villages and rural areas. All of these confirm the size advantage of larger schools when compared to schools with less number of students.

The financing of the public secondary school system in Nigeria is mainly borne by government from the annual budget, with parents sharing less than one percent of the financial burden. However, household expenditure on education which is an addition to public spending can hardly support government financing obligations, since education is both labour and capital-intensive. This calls to question the challenge of resource allocation in the face of financial constraints. There are certain reasons why the financing of secondary education is becoming problematic: the growth in enrolment rates, the rate of urbanization has grown with the effect of attracting parents to seek access to secondary schools in towns and cities; and the fact that most city schools are usually able to upset their financial expenses through support from local authorities and governments as distinct from schools in rural areas with relatively poor residents (Bray, 1998). These urban schools are usually staffed with qualified teachers who want to have easy access to other social

amenities that are usually available in towns and cities. On the other hand, the rural schools usually finds it difficult to get government attention because of their remote location In this case, increasing average school size particularly those in rural area would reduce operational unit costs. Many schools in the rural settlement are usually adjudged not to be quite ideal in size for a typical school as they are characterized with very few students on the average, while most of the ones in the urban areas are said to be too large resulting to undue pressure on the available facilities. The argument is that schools of small sizes (as reflected in the size characteristics such as low student enrolment and average-class size), face a higher per-pupil cost of production, while there are substantial economies of scale in schools with greater number of students. (Tostel, 2003; Ledyard, 2003; Andrews, Duncombe and Yinger 2002; Chakraborty, Biswas & Lewis 1999;). In support of the cost-effectiveness rationale for increased school enrolment in these under-enrolled rural schools, Bray (1994), remarked that since the provision of libraries, laboratories, and workshops needed for specialization are expensive, it is important for them to be fully utilized. The problem remains therefore that number of schools in rural areas are under-enrolled (Calloids and Lewin 2001). Thus there is need to improve control over the cost of secondary schooling while at the same time providing increase enrolment for all secondary school-aged children.

Statement of the problem

The incidence of wide gap in enrolment between rural and urban public schools constitutes a serious threat to educational development. As fewer students are enrolled in rural schools vis-à-vis the congested urban schools, resources such as classrooms, teachers and other facilities may be grossly under-utilized in rural schools and over utilized in urban schools, thereby raising the problem of high recurrent cost of school operation. When there is increased operational cost in schools, it could restrict government's effort at providing the needed financial support to improve school output particularly at the secondary level. Despite this fear of restricted financing of education due to high cost, resources in most rural schools are under-utilized while those of urban schools are over stretched thereby increasing the financial burden of education on the government. Moreover, there seems to be limited previous studies in the state on the problem of differential enrolment and operational cost between urban and rural schools. This study was therefore investigated to find out the difference in enrolment and operational unit cost between urban and rural public secondary schools in Edo state in order to explore ways of improving efficiency in the school system.

Research question

R Q1: What is the functional relationship between enrolment variable and recurrent average cost in the sampled urban and rural secondary schools in Edo state?

Hypotheses

Ho_1: There is no significant difference in enrolment (school size) between urban and rurally located public secondary schools in Edo State, Nigeria.

Ho_2: There is no significant difference in unit cost (UC) between urban and rurally located public secondary schools in Edo State.

Methodology

This study primarily concentrated on the government financed public

secondary schools, while the cost analyzed was the recurrent or operational cost. It excludes capital expenditures which are usually insignificant in the long term because they are usually spread over the life time of the schools. The study adopted the descriptive research design of survey type. The population of the study consisted of all the principals in all the 540 public secondary schools in Edo state. Two hundred and sixteen (216) or 40% of the schools and principals were selected using the stratified and simple random sampling techniques. An inventory on school enrolment and operational expenditure was used to obtain relevant information from the individual schools while the state Ministry of Education provided the list of schools, enrolment and total school expenditure for the period. The principals or the individual schools or their representatives responded to the self-designed inventory which was used to obtain secondary data on individual school enrolment and recurrent expenditure. However, two hundred or 92.5% of the responses were returned. The t-statistics analytical tool was used to test the hypotheses raised in the study. The hypotheses were tested at 5% level of significance.

Moreover, a regression model was specified to test the functional relationship of enrolment and the operational unit cost in the sampled urban and rural schools in the state. The model was in the form:

$Y = a_o + a_1x_1 + e$ ..... (1) Linear

$Y = b_o + b_1 x_1 + b_2x^2 + e$ ..... (2) Quadratic

Where:

Y = unit cost for cross section schools

x = the enrolment variable for the sampled schools;

e = error term, assumed to be independently and identically distributed

a_o and b_o are constants

a_1 and b_1 are the parameters of the preliminary curve fitting exercise.

Given that the curve fitting was done in a bi-variate sense, we therefore estimated each of equation (1) and (2) separately for the enrolment variable in order to show the long term relationship between enrolment and the unit cost. It is hypothetically believed that the greater the enrolment, the lower the operational unit cost in the school. Thus, comparison between equation (1) and (2) was made through the obtained coefficient of determination (R^2) and the shape of the curve especially if curve is convex (U-shaped) as theoretically postulated. Therefore, two models equations (1) and (2) were estimated for a single Y-variable (unit cost) for enrolment variable in the sampled (urban and rural) schools (Babalola, 2000)

Results and discussion

The findings of this study were discussed in line with the research question and hypotheses raised in the study.

Table 1: Enrolment - Cost Estimation Regression Model

Model	Urban			Rural		
	X^1	X^2	R^2	X^1	X^2	R^2
Linear	-27.874	–	0.308	-68.532	–	0.336
Quadratic	-86.870	0.053	0.408	-232..975	0.212	0.499

Source: Author's Field Survey

The result in table 1 presents the relationship between recurrent unit cost and enrolment variable as earlier specified in equation 1 and 2. The values of the specified equations for enrolment were fitted into the equations for the different sample locations i.e. urban and rural in order to show the behaviour of the relationship between enrolment and unit cost.

RQ1: What is the functional relationship between recurrent average cost and enrolment (school size) variable in the sampled urban and rural secondary schools in the state?

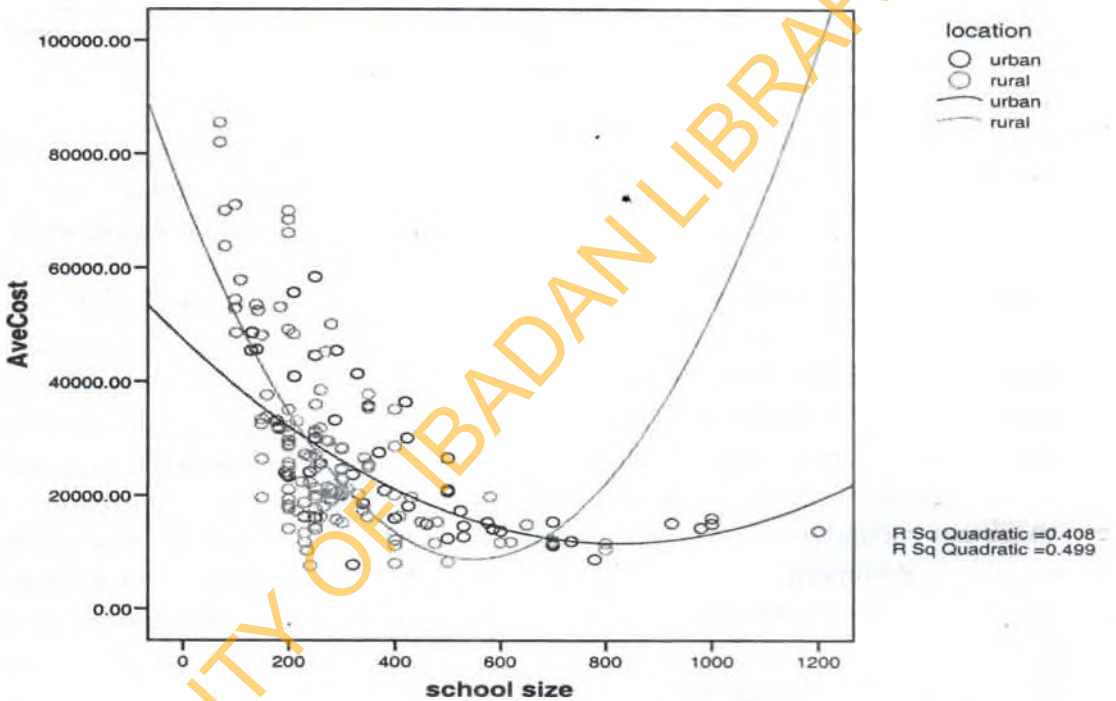

Fig 1: Relationship of unit cost to enrollment (school size) in urban and rural public secondary schools in Edo state, Nigeria

Fig 1 showed that recurrent unit cost was originally high for both samples initially but was much higher in rural schools. At some higher level of enrolment (school size), unit cost kept falling over an increase enrolment but falling more deeply in rural schools until an enrolment of about 600 students was reached. Further increases in enrolment quickly pushed up the recurrent unit cost more steeply in rural schools while urban schools still maintain relatively low average cost even at enrolment of about 1000 students. Points of intersection between curves show the minimum and maximum enrolment levels and their respective unit costs. About 50 percent of the cost of schooling in rural areas is determined by size of enrolment.

Ho_1: There is no significant difference in enrolment (school size) between urban and rurally located public secondary school in Edo State, Nigeria.

Table 2 shows the null hypothesis test of the difference in enrolment between urban and rurally located public secondary schools in Edo state, Nigeria based on field survey.

Table 2: t-test analysis of the difference in enrolment between urban and rural secondary schools in Edo State

Sample Location	N	$\overline{X}$	SD	Std Error of Mean	t	Df	P
Urban	70	399.07	238.61	28.52			
Rural	130	279.69	138.66	12.16	4.476	198	.000

$P < 0.05$

Table 2 showed that there was a significant difference between the average enrollment of urban schools approximately 70 students and that of rural schools (279) students per school. Therefore, the null hypothesis was rejected. Urban secondary schools had greater mean score than rural schools.

Ho_2: There is no significant difference in unit cost (UC) between rural and urban sampled public secondary schools in the state.

This hypothesis in table 3 was tested to find out if there is any significant difference in unit cost between urban and rurally located secondary schools in the state.

Table 3: t-test analysis of the difference in recurrent unit cost in selected urban and rural public secondary schools in Edo State

Sample Location	N	$\overline{X}$	SD	Std Error of Mean	t	Df	P
Urban	70	24,109.15	11975.71	1431.37			
Rural	130	28,326.28	16398.45	1438.23	-2.078	198	0.039

$P < 0.05$

The result of the difference average recurrent of school operation in the states shows that average unit cost is lower in urban schools (N24, 109.15k) than in rural schools (N28, 326.28k). From the table, it is observed that p= 0.039 which was lower than the alpha level of 0.05. Thus, the null hypothesis is rejected, implying that there is a significant difference in unit cost of the selected urban and rural public secondary schools in Edo state.

Discussion

Table 1 supports the specified quadratic equation over the linear equation. Firstly, the coefficient of determination R^2 is larger for the quadratic specification than for the linear, and this result is consistent over the two (2) sub-samples i.e. urban and rural for the enrolment variable. Secondly, the hypothetical (quadratic) shape of the average cost curve is confirmed by the signs of the quadratic parameters. The negative signs of variables X imply that recurrent unit cost initially falls over some range of school enrolment by the amount indicated. Meanwhile, the positive sign of the X^2 variables implies that unit cost later rise at some higher level of enrolment, thereby forming a U-shaped cost curve. This informed the need to model the relationships quadratically as had been given earlier by equation (see equation 2).

Figure 1 showed that the graphical representation of the relationship between enrolment (school size) and unit cost is a downward sloping curve which there after takes an upward trend at a continued and increased enrolment showing a U-shaped relationship between enrolment and recurrent unit cost. Analysis of the result as revealed in figure 1, shows that the cost of

operating rural schools was initially higher at lower enrolment than those of urban schools. This justified the assertion of Afolabi (2001) and Bray (1998) who maintained that schools in rural areas face the problem of under-enrollment and hence increased cost and wastage of the limited financial resources. The average cost curve is relatively steeper at a fewer number of students in rural schools. With an increased enrolment in both sample locations, unit cost fall particularly in rural schools at the initial stage. As the enrolment increased from beyond 200 students to about 600 students in rural schools, the unit cost decreased from about N30, 000 to about N10, 000. The implication is that there is potential for increasing schools' enrolment to at least 600 students in rural schools. The result showed a declining average cost curve, but there appear to be a point beyond which further increase in enrolment will increase unit cost. The finding confirms the many U-shaped cost curves in economic theories which predict that as the number of units of output (students) increases from zero, unit cost decreases as fixed costs are spread over more and more units (Mingat & Tan 1987, Cohn 1979). The result is also akin to the works of Butler and Monk (1985), Cohn, Rhine and Santos (1989) who found that small local schools can capture significant economies of scale with marginal changes in the enrolment. The relationship between per- student expenditure and enrolment in urban schools was downward i.e. negative as enrolment grows, but at a flatter rate than the rurally located schools. At a certain enrolment level beyond 825 students, the cost curve began to take a U-shaped trend upward indicating that a further enrolment of students beyond that point will increase the unit cost of operation. McKenzie (1999) had posited that this type of cost curve is common when measuring or analyzing the economies of scale in education. However, some other researchers have found a concave shape (Babalola 2000) while some other researchers found an L-shaped relationship between cost and sizes of schools (McKenzie 1995; Cumming 1971). All of these suggest the existence of economies and diseconomies of scale as the level of enrolment changes. This means that there is a downward sloping cost curve after which the curve begins to rise at a certain size. The implication of the result at all samples is that school size (Enrolment) in Edo State public schools falls below the optimum size, this is more pronounced in the rural areas.

The results of the unit cost difference between urban and rural schools show that there is statistically significant difference in the unit cost ($t = 2.078$, $p < 0.05$) between urban and rural schools in the state. Schools in urban centers have relatively lower unit cost (N24, 109.15) than those in rural areas (N28, 326.28). This could be attributed to the very few students' enrolment in most of the rural schools characterized by underutilized classrooms space and under-utilization of teachers in the respective schools (Afolabi, 2002; Oladejo 2001; and Bray, 1994). There may therefore be the need to increase school enrolment in rural areas which could be achieved by consolidating these small-sized schools rather than establishing additional secondary schools in every village and remote areas with consequential additional costs. This could help to save money that would have otherwise been expended on running of such under-utilized schools. However, the effect of such merger may have to be weighed against the possible savings that may accrue from the closure of such inefficient merged schools. The benefit of economies of larger school size

could be tapped when school enrolments are increased as it would invariably lead to a fall in the unit cost of schooling. Such tapped financial benefits could then be ploughed back into the schools to improve their service delivery. The result of the test of difference in school enrolment to school location indicate that there is equally a significant difference in enrolment size between urban and rurally located schools ($t = 4.476$, $p < 0.05$). The total enrolment for urban schools during the period under review stood at about 440 students on the average while it is approximately 280 students in rural schools. The finding confirms those of Afolabi (2002) and Sheyin (2002), who found that enrolment in rural schools is smaller than enrolment in urban schools. Although enrolment in both samples is relatively small, it is more pronounced in rural schools. One of the implications of small-sized rural schools includes limited social interaction among students (Bray, 1994). Thus, it cannot be said that several small-sized schools are always preferable to a single large one. The large school sizes in most cases enjoy better social advantages than the small-sized schools. For instance, there will be better cohesion and interaction in a single large school than small schools with very few students spread within every school settlement. For instance, if a village has two schools, it may suffer from social division but would be united if there were only one. Moreover, larger schools sometimes widen pupils and parents' horizons thereby helping them to meet people outside their immediate neighborhood. This view is supported by Bray (1998) and Ojoawo (1990). Thus, there are economic disadvantages of small-sized schools, many of which are mainly located in rural areas (Bray, 1998). This has informed the need to consolidate small schools with very few students. This is consistent with the works of Bray (1994) and Lewin (2001). The implication is that most of the public secondary schools in rural areas are grossly under-utilized. A situation where there are very few students to a class may limit social interaction among the students. The author's personal experience at some of the local village schools during the field exercise showed of the gross under-utilization of scarce resources. If more use of resources were allowed and minimum class-sizes were probably introduced among these under-utilized rural schools, considerable benefits in terms of reduced cost would not only be achieved, but greater and increased number of student would certainly gain opportunity of access to secondary education. Policy towards increasing school enrolment size seems therefore to be encouraged if access and cost reduction strategies are to be improved upon. Although proponents of small schools argued that, with fewer students per school or per class, teachers are able to reach the individual student and attend to their personal needs (Cotton 1996; Haller & Monk 1993). However, limited enrolment or even classes of very few students do not automatically translate to quality schooling. For instance, some research analysis has shown that achievement is not easily associated with the number of students per class but with what really goes on within the class (Hannushek, 1998). Thus, a plausible implication is that what matter is not so much the size of the class but as to what takes place within it. Hannushek and Kim (1996) argued that the quality of teacher plays more positive role than the number of pupils in a school or class. Therefore,

the existence of very small enrolments or classes in rural schools amounts to gross wastage and inefficiency in the face of limited government budgets to education. Improving the cost-efficiency of secondary education therefore, is an essential element in making the expansion of secondary education affordable. Hence, it is possible to produce a higher number of graduates with the same level of resources at a particular time.

Summary

Apparently, the outcome of this study show that differences in enrolment between urban and rural schools in Edo state exists. This difference is most certainly not due to fixed policy by the state but rather due to the lack of it. In fact, this lack of appropriate enrolment policy to define the permissible enrolment limits for the type of school location may have been the reason for the significant difference in enrolment between urban and rural schools in the state. While secondary schools in the urban areas experience a fairly relative level of enrollment, most of the schools in the rural areas are under-enrolled. Perhaps, most parents would prefer urban schools for their wards owing to the availability of school facilities that would aid the performance of their children. Most of these facilities are usually hardly available in remote schools which could invariably impact on the enrolment of such schools. This situation is grave and contradicts the national goal of egalitarianism and rural development. Moreover, the variation in enrolment has important implications and consequences for costs. In specific terms, schools with declining enrolment tend to exhibit higher recurrent cost on the average while schools of larger enrolments enjoy lower average cost per student. With a higher cost of school operation, provision of educational needs in schools could be restricted.

Conclusion

In conclusion, it is evidenced that there is a trade-off between increasing enrolment and reducing operational costs in schools and vice-visa depicting the existence of economies and diseconomies of size. Consequently, the unit cost of education could be reduced through efficient utilization of resources. This could be achieved by increasing the school enrolment particularly at the rural areas to its capacity. Thus, it will be more cost-effective to exhaustively utilize the available space in those under-enrolled rural schools characterized with low average enrolment so as to reduce cost and minimize wastages in public secondary schools in the state. Countries and or states with low income level could save resources and improve learning by increasing school enrolment. Therefore policy towards improving effective schools in rural areas needs to be formulated for overall educational development.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Efforts towards improving enrolment in rural schools should be encouraged by the government through relevant policies. This could help to bridge the inequality gap in educational progress between urban and rural schools.
2. Excessive pressure on urban schools' facilities should be reduced through students' redistribution from congested schools to the very under-utilized ones.
3. Rather than building new schools with relatively few enrolments, especially in rural areas, it may be necessary to merge some schools that are not

too distant from each other. This will help to reduce unnecessary financial burden on the government and save a sizeable amount of money.

4. As a follow up to the preceding point, the money saved from this merger could be ploughed back into the merged schools to improve the quality of the schools.

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