A time series analysis of education expenditure on primary schools

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INTRODUCTION

Background statement

Education is unarguably one of the most important in shaping the life of any citizen in the community today. The treasure of education in Africa has been gradually increasing over the years. It is expected that for learners to produce good results, they must have good and conducive learning environments. Good infrastructure for example, creates a favorable environment for learning. With our country being in an able position to cater for all the needs of the learners, the budget committee which reports on budgetary projections, economic forecasts and make proposals to Committees of Parliament responsible for budgetary matters should have adequate information on the amounts to be allocated to this sector. Even if the government seems to have serious commitments to educational developments, it is felt that the attention given to physical facilities is far from being adequate.

The country's population has been increasing exponentially over the years. The growth of the population from 8. 1 million in 1960 to an estimated 50 million in 2018 can be attributed to the fact that the population structure is an expansive pyramid. Such a population structure has a high percentage of the young. According to worldpopulationreview. com, Kenya ranks 29th in the world most populated country in the world in 2018. Almost three quarters of this population is below 30 years. An Increase in the general population implies increase in the enrollments in schools.

Setting high education standards requires transparency in the system. Corruption in the ministry of education can be found in different forms such as grabbing of school lands, selling of free books, demanding for school tuition fees on a government schools and many more. The cost is always high. The issue has to be dealt with accordingly. Stolen resources will consequently have overcrowding on the same. When books for example meant to be given freely are sold it to learners at school, not all will get. The TSC has been on the spot for alleged mismanagement of funds across the years. The Education Management Information System (EMIS) is a system used to provide timely and effective and user-appropriate information for the management of education development at all levels. (W. J. Muhia 2014) Sadly most branches of EMIS are functional but not effective.

The primary education is the most basic one and important that an individual can acquire. The largest percentage of the population always gets through it. This means that it is one of the most important sector the government must first focus on before the next levels of education. Introduction of the free primary education by the NARC government in 2003 brought a new phase in the education system in Kenya. It shed light to the nation that for us to embrace developments, education is the backbone. The government expenditure on education rose though not relative to the 1. 2 million learners who joined school due to this.

We say that a place, community or society is overpopulated when the available resources cannot cater for residents of the place or society. We should not blame the rapid rising population for the problems in our schools.

With the introduction of the 2-6-3-3 system which will become fully effective in few years to come, the government will have to revise its budget allocation to schools. It is expected that there will be a great rise in funding of this system which will heavily dwell also on the practicality of life in schools. The Kenyan labour market is slowly beginning to embrace technology and therefore need for skill-based curriculum. This system will come with a number of factors to consider apart from the obvious ones. The government for example may have to increase the number of TVET and numerous facilities in the colleges to equip learners with practical life experiences just ready for the job markets. This means more teachers and trainers will have to be employed and all this requires money and resources. A good student teacher ratio would mean that a teacher has just enough learners to perfectly monitor. Learners perform better when close attention is given to them. When the growing population of learners is not met with additional teachers and facilities too, it means learners will have to crowd over the limited resources. Presenting to a teacher a homogenous task of controlling an excess number of learners leads to a mess. It makes simple tasks such as taking of attendance impossible reduces the quality of instructional planning and lowers morale among learners and teachers. If the government would ignore these factors, our schools will be overpopulated and it will be difficult to produce excellent graduates ready for the job market. A proper plan is needed with the government able to know expected amounts to allocate to the education sector in each of the coming years. Without proper measures, this might become one of the difficult problems to expect in the coming years.

Time series

Time series is a list of data points listed in time order. Unlike other types of data points, they have a natural temporal ordering. This may imply that observations close together in time will be more closely related than observations far apart. Time series analysis comprises of methods used to analyze time series data to extract meaningful statistics and other useful information. We shall use time series analysis on real-valued discrete numeric data. The techniques in time series analysis may be parametric or non-parametric. The former assuming that the underlying process has a certain structure which can be described using a small number of parameters. One can use for example a moving average or an autoregressive model. The task becomes to approximate the parameters of the model that describes this process. Non-parametric methods explicitly estimate the covariance or the spectrum of the process without assuming that the process has any particular structure. Forecasting will be the best part of it. Analyzing the years since independence and using the budget allocated to education as the data points, a model is used to predict future expected figures based on previous ones. In this project, we shall conduct an analysis of these data points to forecast on the expected government budget allocation to primary education based on past allocations. We shall then give a recommendation on how the amounts should be increased in order to have a smooth learning curriculum.

STATEMENT OF PROBLEM

In most developing countries education has been taking the largest shares when it comes to the national budget. This is not different in Kenya. The Kenyan government used over 17 percent of its budget on education alone in 2010; in the year 2011 according to the Kenya National Bureau of Statistics it used 13. 5 percent which is still a significant figure. This budget allocations in education show how crucial it is in the nation development process. The introduction of free primary education program in 2003 is the most pro-poor policies enacted by the government. This policy provided the platform to reduce inequalities on income among the population in future. Since it began the program has helped in achieving the United Nations Primary school enrolment Millennium development Goal. Most families cherish education, it is usually a chance which most children from poor background have to escape poverty and compete with those from well off families. The total number of pupils in the primary level has been gradually increasing over the years since independence in 1963. With the introduction of free primary education the number of children attending public primary school spiked drastically. The children who stayed at home because of lack school fees were now able to resume school, and some of those pupils who studied in private school also exited and joined the free public schools. This has been the trend of the number of pupils attending the government's free primary school ever since though the private sector too keeps increasing due to the quality of education offered in their schools. The rise in pupils in primary schools has also been contributed by the increase in the population. According to the Kenyan census (years and numbers) the population has been drastically increasing after every 10 years. In 1979 the population was

15, 327, 061 in 1989 it was 21, 448, 774, in 1999 it increased to 28, 686, 607 and finally in 2009 it was 40, 610, 097. (population growth constant as per the 2009 census) The increase in population was contributed by improved health services which saw a reduction in child mortality. Because of the increase in the children's population each year there is hence the need for the government to accurately budget for the primary education. In this project the model that is to be used helps in analyzing the government expenditure on primary education and predict the same in 2030. This would help the government prepare and examine its trend over the years and also predict and plan for the progressive increase in the number of pupils in primary schools each year.

OBJECTIVES

The main objective of this study is to use time series method to analyze government expenditure on primary education over the years.

The specific objectives are;

1) To identify patterns in the data

2) To fit a suitable time series model to the data

3) To use the fitted model to forecast future government expenditure in primary education.

SIGNIFICANCE OF STUDY

The primary level of education is the sole fundamental phase of education hence lays a great foundation to one's education life. An effective start off at this level has great positive impact in the proceeding secondary and tertiary level. Government expenditure on education is usually seen as an investment of the government in the human capital since it provides skills and knowledge to individuals which in turn assists in unemployment reduction, improvement of health facility, social and political participation and enhance efficient production of goods and services thus promoting growth in its economy. All this has been realized since the number of educated people begun to rise after the country attained its independence.

While Implementation of Free Primary Education (FPE) led to primary enrolment increasing by 1. 2 million, and contributed to achieving Universal Primary Education, it also led to overpopulation in public primary schools, which as a result affected the quality of education negatively. In this project, the prediction will assist the government to prepare and plan for the increasing population and help solve the reduction in quality of education in public primary schools. The government through its expenditure should prioritize the schools with higher population, poor infrastructure, insufficient resources and inadequate teachers. The data with increasing population of pupils will enable the government to know when to build new schools, increase the number of teachers in the schools hence improve the education quality, improve its infrastructures like the size of the school library and increase resources such as the number of books to deliver to these schools. Also, through the prediction, the government can allocate expenditures

which will allow the County education officers to frequently visit schools and ensure services are delivered by teachers as expected. Through this it will be able to prevent issues such as high rate of teachers' absenteeism in class and make them accountable and thus improve education quality delivered.

By forecasting the government expenditure in primary education, the study will be in a position to determine whether the expenditure will increase relative to the increasing total number of pupils in the coming years. If it does so, it will be able to budget effectively during its annual budget. At times institutions where the government budget on education is unsatisfactory funding can come from the private sector and or the households who include the parents or the clients.

The concept of pupils enrolment

Since independence, the education system has witnessed different changes in structures and curriculum. In the current 8-4-4 system, most parents would prefer taking their kids to school between ages of 5 to 7 years where they are expected to complete their primary studies after 8 years. This is followed secondary education for 4 years which paves way for tertiary education. the tertiary education is provided by several institutions such as polytechnics, technical institutes, colleges and universities. University education for majority of degree programs runs for four years.

According to data collected in 1997 on educational pyramids indicates that 44% of working age population had not finished basic primary while at least 21% has gone through primary for the whole 8 years. around 17% enrolled in

lower secondary (form 1 and 2) while 13. 7% has gone through all the 4 year course the rest 4% had enrolled past lower secondary education and had studied for at least 10 years (see Kimalu et al . 2001)

Learning Resources and pupils enrollment

Maicibi (2003) postulates that if their required and enough human resources are brought together, they can influence other resources towards achieving the targets and goals of different institutes.

William (1979), Mutai (2006) asserts that the process of learning is boosted when there is adequate for making references such as textbooks and teaching aids that increase morale of students and teachers.

Compassion (2011) claims that sponsors gives support to primary school pupils in different forms that is by providing exercise books, school uniforms, bags and lamps that enables them to carry out studies adequately while at home, this ensures that pupils are maintained in schools since they have required resources to enable them carry on with their studies adequately.

Lowe (2009) postulates that pupils tend to be allowed to learn in a preferred way using variety of learning materials, learners should be given a chance to practice their own style of leaning. according to MOE (2011) pupil's performance can be affected can be affected by availability of resources, distribution and maximum utilization.

Enrollment and pupils academic performance

The declaration of free primary education (FPE) in Kenya caused an increase in pupils enrollment , this has a great impact on teaching and learning . proper management skills can help in contributing in realization of national education goals . the gross enrollment rate (GRE) of pupils increased from 92% in 2002 to 104% in 2003(republic of kenya, 2007). by 2006 the total enrollment in primary school was 7. 63 million up from 7. 59 million in the year 2005 . the increase was extremely large since some of the pupils joining school s were adults. This increase led to different challenges i. e. overcrowding of classrooms because most of the schools lacked required number of classrooms to accommodate drastically increased number of pupils enrolled under FPE (UNESCO, 2005)

Literature review

Government funding to primary education has gone miles to influencing access to education, improved education outcome, high enrollment and completion rates. By promoting basic literacy and numeracy, primary education provides the foundation for secondary and tertiary education, allowing for a more knowledgeable and productive labor force (Tara Iyer, 2009). Tara iyer adds that government funding of primary education is crucial and necessary for greater nationwide enrollment; For instance, higher spending on primary education may have a positive effect on enrollment, but a higher demand for primary education, reflected in higher enrollment rates, may also provide a push for higher spending. Obi and Zita Chika (2014) states that the focus on education as a capital good relates to the concept of human capital, which emphasizes that the development of skills is equally an

important factor in production as are finance, natural resources and physical equipment. Thus, the question of internal efficiency in education is ultimately linked to the issue of resource allocation and utilization Keiichi Ogawa (2004). he also states that in many developing countries, one of the major challenges facing public institutions is the efficient and equitable reallocation of public resources. Although government spending targets improving educational outcome, Samer (2003) in his research finds that the link between resources and education outcomes are weak and that the achievement of the educational targets will require more than just increase in expenditure on primary education; not to imply that increased resources are unnecessary, merely that they are unlikely to be sufficient for achieving the education goals. He attributes the weak relationship to three due factors; poor data, the failure to account for other factors determining education outcomes (e. g. household spending) and differences in the efficiency of public spending across countries. Regarding the different stages of education, the economics literature of early intervention has demonstrated that early investments in education are more important than later investments, Daniela del et. al (2018). Recent empirical analyses also suggest that not only the level of government investment is important but also its timing. Specifically, government's investments in early education appears to have a stronger impact on later individuals' cognitive outcomes than investments in adolescence or during adults' years (Carneiro and Heckman, 2003). Early investment raises the productivity of later investment. This return is generated from returns to the individual in terms of increased earnings, higher education, improved physical and mental well-

being, and also through the positive externalities to society in terms of

reduced crime and delinquency