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DATA VISUALIZATION: ANALYZE THE CORRELATION BETWEEN THE BUDGET OF EDUCATION AND STUDENTS PERFORMANCE

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ABSTRACT

An approach to the evaluation of funding education system that sets inputs in relation to the performance of a system, such as the quality of teaching and learning and educational outcomes, has the potential to improve decision making and make the use of available resources more effective; Therefore, exploring how resources are allocated is critical for ensuring a high-quality education for all students. The main aim of this study is to analyze the correlation of budget supplied in education and the performance of students. This research is using the data corrected from the World Bank platform related to the "Government expenditure on education". Findings indicate that for all countries, none of them the number of students performed and graduated to doctoral level does not assure that the number of researchers in that country will increase or vary as well.

Keywords: *Education, Correlation, data analysis, Data mining, students' performance*

• INTRODUCTION

Evaluating how funding relates to the quality of teaching, learning and students' performance is even more challenging in systems with a large extent, an approach to the evaluation of funding that sets inputs in relation to the performance of a system, such as the quality of teaching and learning and educational outcomes, has the potential to improve decision making and make the use of available resources more effective. The analysis of efficiency and effectiveness requires sufficient analytical capacity and the ability to interpret the available data.

Academic performance refers to the knowledge obtained and marked by the score given by the teacher. In the context of education, academic achievement is an educational goal achieved by students, teachers or institutions for a certain period and measured either by continuous examination or assessment (Amir, M. et al, 2019).

In spite of the lack of universal agreement as to whether money, by itself, makes a difference in student achievement, most researchers agree that what schools spend money on does affect student learning. Therefore, exploring how resources are allocated is critical for ensuring a high-quality education for all students (Scott, 2009). Every goal set by organizations is formulated in their budget plan in order to make it easier for teams to achieve their performance targets, which are in accordance with their organization's vision and mission; This is consistent with the premise of goal-setting theory, which claims that difficult goals, but with specific targets, will result in high performance.

Budgets constitute a mechanism that can be utilized to coordinate the various parts of an organization, to control and measure students' performance, to motivate personnel, and to improve communication. According to (Suryo, P. et al., 2020) this is supported by the fact that in the field many academics, mainly those who are not from the disciplines of accounting, finance or management, perceive that the focus of HEIs should be on providing quality education, not improving financial performance.

In many countries around the world, schools are spending more money on students than ever before; in the past few years, protests across the U.S. have brought the issue of school budgets into the national conversation. Education professionals who reached their breaking point made their voices heard with strikes (WU, 2018).

The students' performance (academic achievement) plays an important role in producing the best quality graduates who will become great leaders and manpower for the country thus responsible for the country's economic and social development (Irfan, M. & Shabana, N. K., 2012).

In this research, the main aim is to analyze the correlation of budget supplied in education and the performance of students. This research is using the data corrected from the World Bank platform related to the "Government expenditure on education".

- **RELATED WORKS**

Various researches were conducted in data mining and statistical concepts just with the purpose of determining the relationship between the budget and students' performance in their class activities such as exams and other regional, national, and/or international level. Here below are some of these research academics reviewed in this study.

In her thesis (Philothere, 2016), argues that education is a form of investment in human capital that yields economic benefits and contributes to a country's future wealth by increasing the productive capacity of its people; the national budget indicates that the total budget of Nyamasheke district was 12.750 billion RWF in 2013/14 budget year. From this budget of 4.109 billion, 32.22% of the total budget was spent on education with secondary education taking 50.32 % (2 billion) of the total spending on education. From this 2 billion spent on secondary education, 63.2% was used for teacher salaries, 7.87% was spent on the payment of capitation grant, 11.65% on school feeding, 0.78% on hygienic and conducive learning environment for girls, 0.75% on supervision of exams and 15.76% was spent on education support projects i.e. provision of tangible fixed assets such as buildings, playgrounds, etc.

It is in that perspective that her thesis sought to establish the link of various factors such as endogenous inputs, number of students, teacher characteristics, students' personal background, and financial inputs to educational school mean performance in public secondary schools in Nyamasheke and Nyarugenge districts.

Financial resources are the key inputs in education production function, and this is because they are used to provide other educational inputs; these inputs are visualized in terms of "Expenditure on staff", "Expenditure on key educational inputs" and "Recurrent expenditure". From findings, the researcher concluded that expenditure on different categories of staff, expenditure on the provision of key educational inputs, the recurrent expenditure of a school, and the total school incomes highly correlate with the school mean performance in Senior 6 National Examination, and they can present between 19% and 62% of variations in the school mean performance, there is a very good reason to conclude and generalize that school mean performance in the two districts highly depends on the quantity of the financial inputs.

The second researcher has been conducted by (Radhika, 2018), studying the Factors Influencing the Student's Academic Performance in secondary schools in India; the researcher argues that there are numerous factors within school and outside school that influence the academic performance of the students, such as financial position of their families, conditions of poverty, provision of tuitions and assistance at home, counselling and guidance, occurrence of conflicts and disputes, employment opportunities, household chores, needs and requirements of other family members and violent and criminal acts. He ends by concluding with saying that in order

to achieve good academic outcomes, it is vital for the students to be dedicated and sincere towards their studies, the home environmental conditions should be peaceful and amiable, and the school should be financially stable.

Another research consulted is a published paper entitled *Educational inputs: A defining factor in planning for quality secondary education in Rwanda* (Alfred, O. & Albert, N., 2016), the authors investigated on the relationship between educational inputs and quality education in day secondary schools, a research conducted using a purposive sampling, 17 head teachers from 17 sectors were selected. Data was gathered using a questionnaire. Analysis of the findings using Pearson correlation between educational inputs and quality of education, was found to be positive and insignificant in the relationship ($r = .138$, $p<.001$) though funding and school characteristics were found to intervene and finally, it was noted that there is inadequate funding for the schools which greatly affected the acquisition of educational inputs that are critical in the provision of quality education.

As takeaway note from the previous research conducted, all the above reviewed academic findings indicate that the inadequate funding or financial for schools will lead to poor planning which later affect the performance of students in one or another way of their learning outcomes or expectancies.

- **METHODOLOGY**

This research is using an analytical survey design to ascertain educational inputs as a factor of students' performance by analyzing the correlation between education budget as share of national GDP with the ratio of students' performance attained on doctoral studies measured by the ratio of researchers involved in research for development. Data for five countries was collected from the World Bank – Development indicators data, available on the World bank website and downloaded as CSV file and treated to get the dataset used in this study.

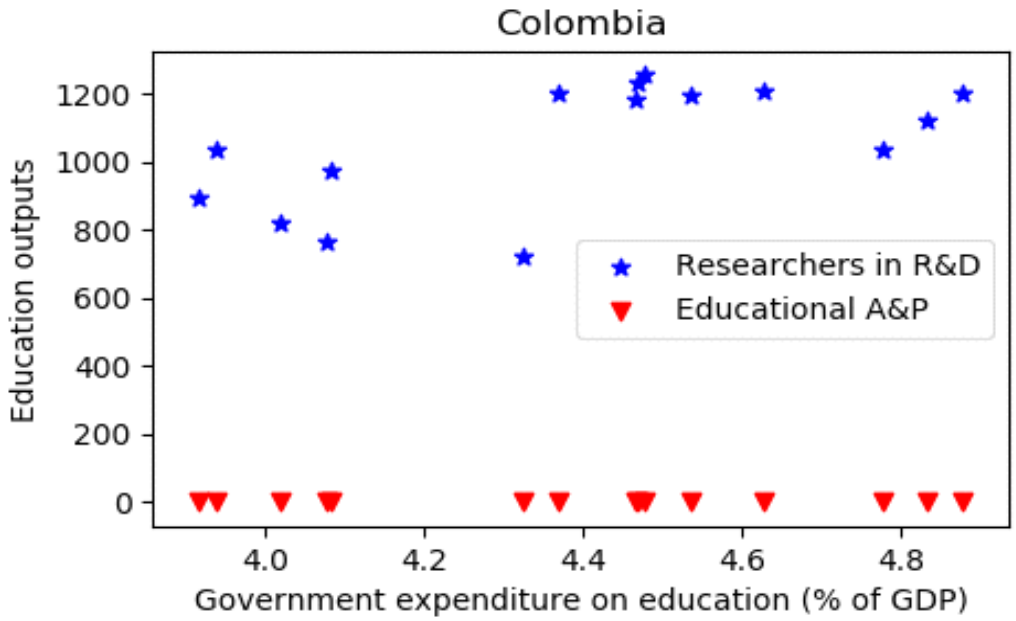
While treating the data in data preprocessing phase, the countries with incomplete data were removed to remain with the complete and remain with five, Colombia, Togo, Malaysia, Iran, and Costa Rica, this treatment of data was carried for all the data selected for this study, Government expenditure on education (% of GDP), Researchers in Research of Development (per million), and Educational attainment and performance at doctoral or equivalent level considering a series of years between 2003 and 2017.

Matplotlib which is a plotting library for the Python programming language and its numerical mathematics extension NumPy were used to plot the scatter graphs. Scatterplots are useful for interpreting trends in statistical data. Each observation (or point) in a scatterplot has two coordinates; the first corresponds to the first piece of data in the pair (that's the X coordinate; the amount that you go left or right). The second coordinate corresponds to the second piece of data in the pair (that's the Y-coordinate; the amount that you go up or down). The point representing that observation is placed at the intersection of the two coordinates (Rumsey, 2019).

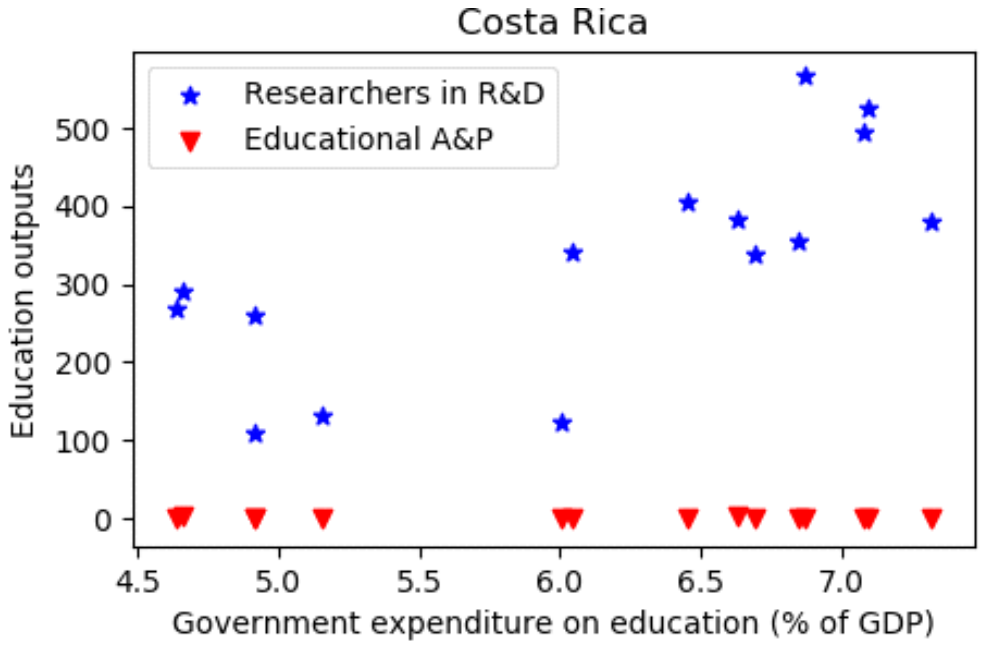
When examining the relationship between our continuous variables, always look at the scatterplot, to see visually the pattern of the relationship between them and look for outliers, which are the observations lying away from the main body of points.

- **RESULTS AND DISCUSSION/FINDINGS**

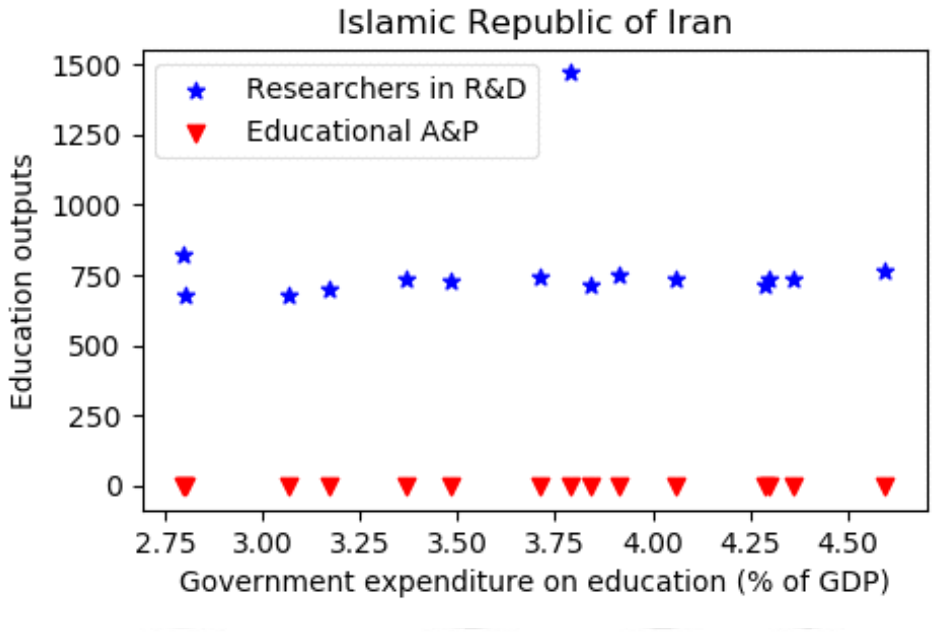
The educational budgets for the country studied in this paper, taking 15 years from 2003 to 2017 are averaged and sorted down-top, we have 3.703%, 4.072%, 4.387%, 5.277%, and 6.089% respectively Islamic Republic of Iran, Togo, Colombia, Malaysia, and Costa Rica. On the other side, when averaging Researchers in Research of Development (per million) we see that the following data present 33.637, 331.542, 780.722, 1055.813, and 1353.809 all over one million of population for Togo, Costa Rica, Islamic Republic of Iran, Colombia, and Malaysia, and then for Educational attainment and performance on doctoral or equivalent level, the data indicates that when they are averaged and ordered from the least to the top we have, 0.335%, 0.698%, 0.703%, 0.841%, and 0.929% for Colombia, Costa Rica, Islamic Republic of Iran, Togo, and Malaysia respectively.



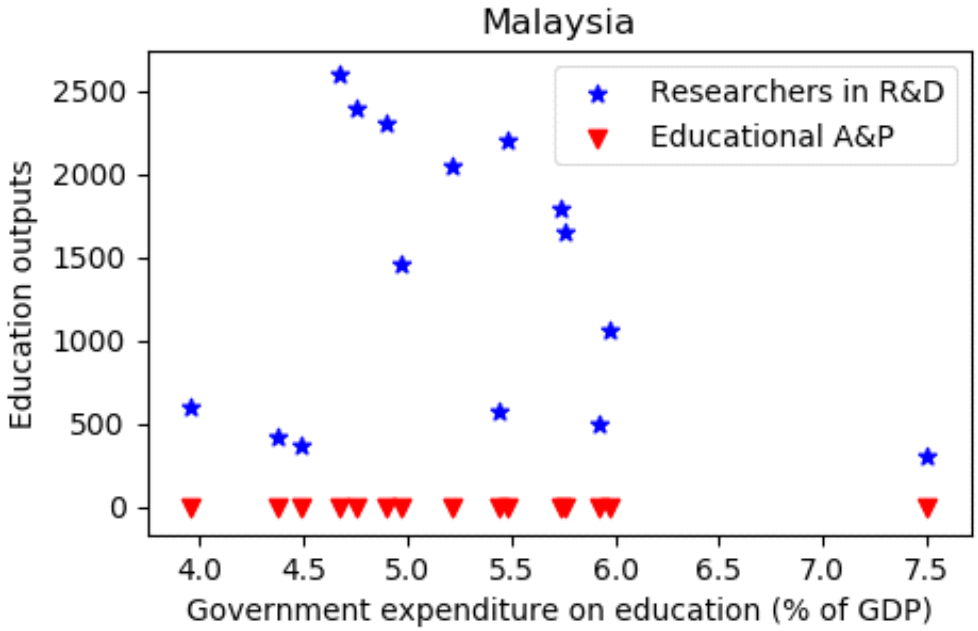
From the above graph, you see that there is a zero correlation between Researchers in research for development and Education attainment and performance at doctoral or equivalent level in Colombia because both variables are not tending in same directions and also the value of Researchers in research for development changes randomly independent of x; which means that there is no relationship between the number of researchers involved in finding responses for development and ratio of students attained the level of doctoral degree.



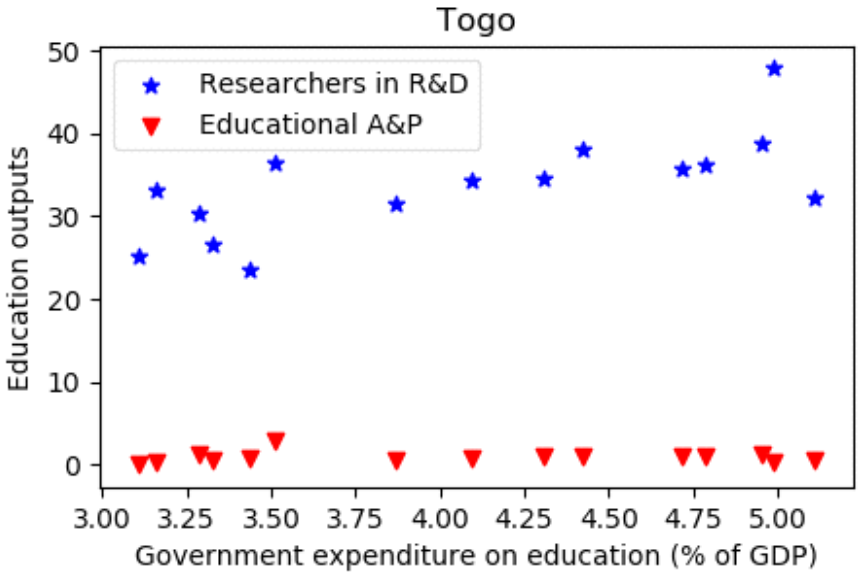
With the case of Costa Rica, a scatter plot is plotted between our used continuous variables and here I am visualizing the results and analyze them to see how both variables are correlated to influence one another; from the graph above you see that Researchers involved in research for development patterns are not aligned at all and are concentrated at top of the graph; while Education attainment and performance at doctoral or equivalent level patterns are linearly aligned along the X axis, generally, there is a weak relationship between both variables.



Same case for Islamic republic of Iran, when visualizing graph for Iran, you see that the patterns for both variables are separately aligned where points for Education attainment and performance at doctoral or equivalent level are aligned along the X axis while patterns for aligned in linearly around 750/1000000 ratio of researchers involved in research for development. Also, you see that the correlation between both variables is weak because there is no statistical relationship, even no common directional orientation.



We often see patterns or relationships in scatterplots; the pattern of points presented by our graph doesn't seem to resemble any kind of pattern, even a vague one. Analysis the above scatter graph for Malaysia plotting the relationship between two variables Researchers in Research of Development (per million), and Educational attainment and performance at doctoral or equivalent level, with observation of the graph then we can conclude that these variables have no relationship; this is because when there is no clear relationship between the two variables, we say there is no correlation between the two variables.



When we look at scatterplot, we should be able to describe the association we see between the variables. A quick description of the relationships and correlations in a scatterplot should always include a description of the form, direction, and strength of the correlation, along with the presence of any outliers. In the case of Togo does not went far compared to other studied and analyzed cases above, that of Iran, Malaysia, Costa Rica, and Colombia because, the variables plotted here indicated that they don't have any correlation as well they present a big scale between them, so we conclude that they are not correlated and none of them is influencing the behavior of another.

• CONCLUSION

This study intends to visualize the relationship between the Researchers in research for development and Education attainment and performance on doctoral or equivalent level aligned with the share of national GDP offered as education budget using five countries selected as case studies; Matplotlib which is a plotting library for the Python programming language and its numerical mathematics extension NumPy were used to plot the scatter graphs which later facilitates in visualization of correlation and analysis of the results of the study. Findings indicate that for all countries, none of them the number of students performed and graduated to doctoral level does not assure that the number of researchers in that country will increase or vary as well.

This means that increasing the share of national GDP for educational budgets will influence and assure the availability of various facilities at schools such as building schools, salaries for school staff, books, etc. as well this has been concluded by previous researchers including whom are cited in this study.

• REFERENCES

Alfred, O. & Albert, N. (2016). Educational inputs: A defining factor in planning for quality secondary education in Rwanda. *International Journal of Development and Sustainability*, 120-136.

Amir, M. et al. (2019). Do Education Budget, Classroom Quality, and Class Ratio Matter To Students' Academic Performance? An Empirical Study In Indonesia. *ISET*, 1-5.

Irfan, M. & Shabana, N. K. (2012). Factors Affecting Students' Academic Performance . *Global Journal of Management and Business Research*, 1-7.

Philothere, N. (2016). *EDUCATIONAL INPUTS AND THEIR IMPLICATIONS FOR OUTPUT IN PUBLIC SECONDARY SCHOOLS IN NYARUGENGE AND NYAMASHEKE DISTRICTS, RWANDA.* Nairobi, Kenya: Kenyatta University.

Radhika, K. (2018). Factors Influencing the Student's Academic Performance in Secondary Schools in India. *University of Delhi*, 1 - 25.

Rumsey, D. J. (2019). *How to Interpret a Scatterplot*. Retrieved from Dummies: https://www.dummies.com/education/math/statistics/how-to-interpret-a-scatterplot/

Scott, A. B. (2009). *School District Budgeting and Student Achievement.* Virginia, USA: Williamsburg–James City County (Virginia).

Suryo, P. et al. (2020). Performance-based budgeting implementation in higher education institutions: Determinants and impact on quality. *Cogent Business & Management*, 1-20.

WU. (2018). *How Budget Cuts Impact Schools*. Retrieved from Walden University: https://www.waldenu.edu/online-masters-programs/ms-in-education/resource/how-budget-cuts-impact-schools