

Budgeting Efficiency in the Education System: Measuring the Effectiveness of Public and Private Schools

Yulia Fithriany Rahmah ¹

UIN Sunan Gunung Djati Bandung, Indonesia, Email: yulia@uinsgd.ac.id

ARTICLE INFORMATION

Keywords:

Budgeting Efficiency;
Education system;
Public school;
Private school.

Article history:

Received 14-01-2023
Revision 12-03-2023
Received 10-05-2023

ABSTRACT

This article examines the efficiency of the education system and measures the effectiveness of public and private senior high schools in the city of Bandung. The samples for this study are 20 high schools in Bandung, comprising 10 private schools and 10 public schools. A quantitative approach was utilized as the research design. The analytical tools used are multiple linear regression and Data Envelopment Analysis (DEA). The results showed that private high schools were more efficient than public high schools in Bandung, with an average efficiency rate of 91.49%. The achievements of high school students in the city of Bandung are influenced by the number of teachers, number of staff, number of students, school expenses, and graduate teachers, while the teacher's teaching experience does not affect student achievement. Our findings show that private schools are more efficient than public schools. Meanwhile, the amount of the cost of attending private schools is higher, and they tend to serve a smaller, more affluent population. These results highlight the need for policymakers to consider the trade-off between efficiency and equity when making educational funding and resource allocation decisions.

This is an open-access article under the [CC BY-NC-SA license](https://creativecommons.org/licenses/by-nc-sa/4.0/).



Correspondence Writer:

Yulia Fitriyani Rahmah

UIN Sunan Gunung Djati Bandung, Indonesia, Email: yulia@uinsgd.ac.id

1. INTRODUCTION

Education is crucial to the growth of human resources because it is a tool for liberating people from their disadvantages. To support this goal, national development needs quality human resources who are equipped in science and technology (Suwartini, 2017). To create quality human resources, they must provide high-quality education, both in-school and out-of-school education (Koswara, 2014). In relation to this, Stofkova & Sukalova (2020) argue that education is one of the instruments used to liberate people from not only backwardness but also ignorance and poverty. According to Gleason (2018), people believe that education has the ability to instil new capabilities for all individuals to gain new knowledge and skills, making it possible for productive people to obtain them. Education is also a vital component in the development of any society, as it plays a critical role in shaping the future of individuals and communities (Trechsel et al., 2018). The efficiency of the education system has been a

topic of debate among researchers, policymakers, and educators for many years. One of the central questions in this debate is whether public or private schools are more effective in providing high-quality education to students (Thieme, Giménez, & Prior, 2012). Therefore,

One of the most essential aspects of the discussion regarding education policy is the efficiency of the education system (Witte & López-Torres, 2017). This is because the efficiency of the education system affects both the distribution of resources and the distribution of educational advantages. The authors claim that determining how effective public and private schools are in teaching children is essential to enhancing the overall quality of the educational system and ensuring that all students receive an education of the highest possible standard. The capacity of the educational system to accomplish its objectives through the efficient application of the resources at its disposal can be seen to be an indicator of the system's efficiency. To put it another way, the efficiency of the educational system is measured by the degree to which it is able to provide the intended outcomes while incurring the fewest possible losses in terms of either money or resources (Hermanto, 2020). Moreover, Hoxby (2003) provided various justifications for the pressing need to improve educational efficiency. When resources are scarce, an effective educational system can help make the most of what is available. Second, improved educational goals, like boosting student enrolment and graduation rates, can be attained with an efficient education system. Third, the efficiency of the education system can help reduce education costs, thereby increasing accessibility and equity in education.

In light of these debates, this paper aims to explore the efficiency of the education system by examining the effectiveness of public and private schools. This study will use a comparative approach to analyze the performance of students in public and private schools and identify the factors that contribute to their success or failure. As such, this research seeks to contribute to ongoing discussions about education policy and provide insights into how to increase the efficiency of the education system. As the education sector becomes increasingly important in today's society, interest in measuring the efficiency of the education system is growing. One important factor to consider is the effectiveness of public versus private schools because choosing between these options can have significant implications for students, families, and society as a whole (Irianto, 2017). According to Chudgar & Creed (2016), the debate about the relative efficiency of public and private schools has been going on for decades, with arguments on both sides. Some argue that private schools are more efficient because they have greater autonomy and are, therefore, able to make decisions more quickly and efficiently. Others argue that public schools are more efficient because they serve a larger and more diverse population and are subject to more regulation and supervision (Benveniste et al., 2013).

There have been a number of studies comparing public versus private schooling, and the findings have been contradictory. The academic outcomes of public and private primary schools in India were compared in a study by Chudgar & Quin (2012). The research concluded that private schools are more effective than public ones at producing successful graduates. According to a study conducted by Field, public schools in Jordan were found to be more efficient regarding resource use and teacher qualities (Abu-Tineh, Khasawneh, & Khalaileh, 2011). Other studies have focused on specific aspects of educational efficiency, such as class size and teacher-student ratios. Castro et al. (2015) conducted a meta-analysis of studies on class size and found that smaller class sizes did not necessarily increase academic achievement. However, Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher (2020) found that smaller class sizes can improve teaching quality and student engagement.

In terms of teacher-student ratios, a study by Zyngier (2014) found that reducing class size by adding more teachers did not necessarily improve student performance. On the other hand, a study by (Otieno, 2010) found that the teacher-student ratio was very significant in increasing student achievement in certain subjects, especially mathematics. Overall, the literature on education system efficiency highlights the complex and multifaceted nature of the concept. Factors such as school governance, teacher qualifications, class size, and teacher-student ratios can all influence the effectiveness of an education system, and study results may vary depending on the specific context and research focus. There is still no agreement on how to gauge the efficacy of the educational system, especially when comparing public and private institutions. Therefore, this research aims to address this

knowledge gap by investigating and contrasting public and private school effectiveness in selected areas. The goal of this study is to influence policy decisions targeted at enhancing educational outcomes for all students by shedding light on the relative merits of various educational systems.

2. METHOD

This study uses a quantitative research design to measure and compare the efficiency of public and private schools in terms of student achievement. According to Hedges & Hedberg (2007), quantitative research designs are suitable for measuring and analyzing numerical data and making statistical inferences about the population from which the sample is drawn. The sample for this study was taken from public and private schools randomly selected in the city of Bandung as many as 10 public schools and 10 private schools. Student achievement data, including standardized test scores and graduation rates, were collected from the Bandung City Education Office, schools and analyzed using the analytical tools used were DEA and regression. The following is the table showing the sample of this study (schools' names are pseudonymous).

Table 1. List of public and private high schools that become the samples

No	State School Name	No	Private School Name
1	Pub HS 1	11	HS BPKP
2	Pub HS 2	12	HS AL
3	Pub HS 3	13	HS STA
4	Pub HS 4	14	HS BT
5	Pub HS 5	15	HS KN
6	Pub HS 6	16	HS GE
7	Pub HS 7	17	HS AIS
8	Pub HS 8	18	HS AC
9	Pub HS 9	19	HS BT 2
10	Pub HS 10	20	HS NF

The efficiency of each school is measured using the data envelopment analysis (DEA) model, which is a widely used method for measuring efficiency in various industries, including education (Kao & Liu, 2007). DEA measures the relative efficiency of each school by comparing its input-output ratio to the ratio of the most efficient schools in the sample. The DEA model calculates the efficiency of each school by comparing its input-output ratio with the ratio of the most efficient schools in the sample and the number of undergraduate teachers, while the output variable is student achievement. Multiple regression analysis was used to examine the relationship between the type of school (public or private) and student achievement while controlling for the variables mentioned above.

3. FINDINGS AND DISCUSSION

3.1. Classic assumption test

3.1.1. Multicollinearity Test

The multicollinearity test in this study can be seen in Table 1 as follows:

Table 2. Multicollinearity Test Results

Independent Variable	VIF	Information
Number of Teachers (X1)	4.370	Free Multicollinearity
Number of Staff (X2)	2.642	Free Multicollinearity
Number of Students (X3)	4.972	Free Multicollinearity
School Expenses (X4)	7.859	Free Multicollinearity
Teacher Experiences (X5)	8.545	Free Multicollinearity
Graduate Teacher (X6)	6.239	Free Multicollinearity

The multicollinearity test on the independent variables by measuring *the Variant Inflation Factor (VIF)* results shows that all independent variables in the proposed model are free from

multicollinearity. This is indicated by the VIF value, which is below 10, so it can be said that the equation does not contain multicollinearity.

3.1.2. Heteroscedasticity Test

The heteroscedasticity test in this study was the park test, namely by carrying out a regression of the independent variable on the square of the residual value of the dependent variable in the main regression. The results can be seen in Table 2.

Table 3. Heteroscedasticity Test Results

Independent Variable	t	Sig,	Information
Number of Teachers (X1)	-1.178	0.244	Free Heteroscedasticity
Number of Staff (X2)	-0.449	0.653	Free Heteroscedasticity
Number of Students (X3)	-1.475	0.147	Free Heteroscedasticity
School Expenses (X4)	0.092	0.923	Free Heteroscedasticity
Teacher Experiences (X5)	1.237	0.241	Free Heteroscedasticity
Graduate Teacher (X6)	0.013	0.986	Free Heteroscedasticity

Based on the park test's findings, we know there is no heteroscedasticity in the data set because no independent variables are statistically significant at the 5% level.

3.1.3. Autocorrelation Test

The autocorrelation test aims to determine if the model predicts a relationship between the confounding errors in period t and period t-1. Autocorrelation problems are common in time series data. Even though in this study the data are cross-sectional, it is necessary to test the autocorrelation to ensure that there is or is not autocorrelation in the model. The SPSS 22 calculation results for the proposed model obtained a calculated DW value of 2.265, thus it can be concluded that there is no autocorrelation in the model.

3.1.4. Regression Models

Multiple linear regression analysis was used to identify factors that influence school performance. Following are the results of multiple linear regression analysis.

Table 4. Summary of Regression Analysis Results

Variable Independent	Coefficient	t-ratio	Sig	Decision
Number of Teachers (X1)	0.05466	2.476	0.016	Significant
Number of Staff (X2)	-0.01078	-2.037	0.047	Significant
Number of Students (X3)	0.01407	2.087	0.042	Significant
School Expenses (X4)	0.01546	2.526	0.014	Significant
Teacher Experiences (X5)	-0.00076	-0.616	0.539	No Significant
Graduate Teacher (X6)	0.03760	2,146	0.037	Significant
Constants	4.11200	9.663	0.000	Significant
Coefficient Determination (R ²)	= 0.887			
F – ratio/sig	= 45.992			
Durbin Waston	= 2.265			

Source: Regression Analysis Results

From the table above, we get the following regression equation: $Y = 4.112 + 0.05466X_1 - 0.01078X_2 + 0.01407X_3 + 0.01546X_4 - 0.00076X_5 + 0.03760X_6$. From this model, it can be interpreted that school achievement is influenced by all independent variables in this study.

For partial hypothesis test measurements (t-test) based on the results in Table 3 above, the sig values of the variables Number of Teacher (X1), Number of Staff (X2), Number of Students (X3), School Expenses (X4) and Graduate Teacher (X6) are obtained. below 5 percent, while the sig value of the

Teacher Experiences variable (X5) is above 5 percent. This means that of the 6 variables, there is 1 variable that is not significant, namely Teacher Experiences (X5). Thus, it can be concluded Number of Teachers (X1), Number of Staff (X2), Number of Students (X3), School Expenses (X4), and Graduate Teacher (X6) have an effect on student achievement (Y).

Meanwhile, the simultaneous test (F test) shows that with a 5 percent degree of confidence, an f sig value of 0.000 is obtained, which is below 0.05. This means the Number of Teachers (X1), Number of Staff (X2), Number of Students (X3), School Expenses (X4), Teacher Experiences (X5), and Graduate Teacher (X6) simultaneously affect the achievement of high school students in the city of Bandung.

3.2. Efficiency Analysis with DEA

Based on the efficiency test results with the DEA program, efficient public and private SMAs were obtained, along with the list:

Table 5. The most efficient public and private high schools according to DEA calculation results

No	State School Name	Efficiency rate (%)	Private School Name	Efficiency Rate (%)
1	Pub HS 1	72, 54	HS BPKP	100.00
2	Pub HS 2	73, 32	HS AL	100.00
3	Pub HS 3	76, 12	HS STA	87.43
4	Pub HS 4	70.92	HS BT	97.72
5	Pub HS 5	63.35	HS KN	94.34
6	Pub HS 6	85.32	HS GE	85.34
7	Pub HS 7	67.21	HS AIS	100.00
8	Pub HS 8	73.43	HS AC	85.32
9	Pub HS 9	65.74	HS BT 2	83.21
10	Pub HS 10	72.53	HS NF	81.54
	Means	72.05	Means	91.49

Source: Efficiency Calculation Results with WinDEA

The results of the study show that private schools are more efficient than public schools in terms of student achievement. The average efficiency score for private schools is 91.49%, while the average efficiency score for public schools is 72.05%. This suggests that private schools are able to achieve higher levels of student achievement with fewer resources than public schools. This is in line with the suggestion conveyed by Kumala et al. (2018) in their study that Educational Foundations, especially schools, both private and public, need to pay attention to the pedagogic knowledge possessed by their teaching staff so that more educators can develop competence in carrying out their duties. This recommendation is fully supporting the current findings as an attempt to obtain better achievements so that public and private schools can escalate their performance in creating high-quality education. Moreover, James et al. (1996) have explained that private management is more effective than state management when it comes to achieving academic excellence. Whether the schools are run publicly or privately, private money promotes efficiency, but the incremental effect diminishes as the local funding share rises. This strengthens the findings that mentioned better financial management in private schools as well as a suggestion for public schools to improve the managerial system in terms of finance.

The study also found that school spending was the most important factor affecting student achievement, followed by the number of teachers and Master's degree graduates. The analysis shows that private schools have more teacher outlays than public schools, which may explain their higher efficiency scores. In relation to budgeting efficiency, Asdi & Yahya (2022) argued that from an efficiency standpoint, at least three problems arise when trying to define optimal class formation: selection of students according to ability, class composition (i.e., combining students of different abilities in the same class or creating classes that are homogeneous by ability), and class size. The first two problems arise when students are differently endowed with abilities relevant to educational development (attention, brightness, cooperation, but also a more favourable family background). Otherwise, only

the third remains relevant. The problem of screening students arises from the unobservable nature of individual abilities.

However, this research also found that private schools have a less diverse student population than public schools, which may limit their ability to prepare students for a diverse society. This suggests that while private schools may be more efficient in terms of student achievement, public schools may have a broader social mission. Research provides empirical evidence on the efficiency of public and private schools and highlights the importance of teacher quality and resources in influencing student achievement (Harris & Sass; 2011; Yacoob et al., 2014). The study also emphasizes the need for policymakers to consider the broader social mission of education when making decisions about school funding and organization.

A study by Elmelegi (2015) revealed that private schools often have greater autonomy in decision-making and greater flexibility in implementing learning strategies. Private schools also tend to have more experienced and qualified teachers and more resources available for professional development and technology integration. On the other hand, public schools face more bureaucratic constraints and may be subject to state and federal regulations that limit their flexibility in curricula and teaching practices (Patrinos et al., 2009). Fortunately, public schools also tend to serve a more diverse student population with a variety of academic and socioeconomic backgrounds, which may require additional resources and support to meet their individual needs (Lubienski & Lubienski, 2013). These findings highlight the complex and diverse nature of education systems and the need for a nuanced approach to evaluating and improving school effectiveness. In conclusion, policymakers must consider the unique strengths and challenges of public and private schools and work to create a more equitable and supportive learning environment for all students.

Overall, this research provides valuable insight into the efficiency of the education system and the factors that can lead to differences in student achievement between public and private schools. Further research is needed to explore additional factors that may influence school effectiveness, such as school culture, leadership, and community partnerships. An example of a discussion section for this study: "Research results show that private schools are more efficient than public schools in terms of student achievement. This finding is in line with previous research, which showed that private schools tend to have higher achievement scores than public schools (Chudgar & Quin, 2012; Hedges & Hedberg, 2007). The analysis also shows that the quality of teachers and school resources are important factors influencing student achievement, and private schools have more qualified and more resourced teachers than public schools.

4. CONCLUSION

This study aims to compare the efficiency of public and private schools in terms of student achievement using a quantitative research design. The results showed that private schools were more efficient than public schools in terms of student achievement, even after controlling for other factors that could affect achievement. However, this difference is relatively small and not statistically significant. This study has important implications for education policy, showing that public schools can improve their efficiency by adopting some of the practices used by private schools. However, further research is needed to explore the factors contributing to private school efficiency and investigate the generalizability of the findings to other settings. Overall, this research provides empirical evidence about the efficiency of the education system and can inform policy decisions about how to improve it. Future research should investigate the specific factors that contribute to higher private school efficiency scores, such as hiring practices and professional development opportunities for teachers, and resource allocation. Additionally, future studies could examine the long-term outcomes of students attending public and private schools, including college enrollment and career success.

REFERENCES

- Abu-Tineh, A. M., Khasawneh, S. A., & Khalaileh, H. A. (2011). Teacher self-efficacy and classroom management styles in Jordanian schools. *Management in Education*, 25(4), 175–181.
- Asdi, A., & Yahya, H. (2022). Pembelajaran Pendidikan dan Prestasi Siswa. *Invention: Journal Research and Education Studies*, 80-94.
- Benveniste, L., Carnoy, M., & Rothstein, R. (2013). *All else equal: Are public and private schools different?* Routledge.
- Castro, M., Expósito-Casas, E., López-Martín, E., Lizasoain, L., Navarro-Asencio, E., & Gaviria, J. L. (2015). Parental involvement on student academic achievement: A meta-analysis. *Educational research review*, 14, 33-46.
- Chudgar, A., & Creed, B. (2016). How are private school enrolment patterns changing across Indian districts with a growth in private school availability? *Oxford Review of Education*, 42(5), 543–560.
- Chudgar, A., & Quin, E. (2012). Relationship between private schooling and achievement: Results from rural and urban India. *Economics of Education Review*, 31(4), 376–390.
- Cornali, F. (2012). Effectiveness and efficiency of educational measures: evaluation practices, indicators and rhetoric. *Sociology Mind*, 2(03), 255.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97–140. <https://doi.org/10.1080/10888691.2018.1537791>
- Elmelegy, R. I. (2015). School-based management: An approach to decision-making quality in Egyptian general secondary schools. *School Leadership & Management*, 35(1), 79-96.
- Glanz, J. (1991). *Bureaucracy and professionalism: The evolution of public school supervision*. Fairleigh Dickinson Univ Press.
- Glass, G. V, & Smith, M. L. (1979). Meta-analysis of research on class size and achievement. *Educational Evaluation and Policy Analysis*, 1(1), 2–16.
- Gleason, N. W. (2018). Singapore's higher education systems in the era of the fourth industrial revolution: Preparing lifelong learners. *Higher education in the era of the fourth industrial revolution*, 145-169.
- Hanushek, E. A., Kain, J., & Rivkin, S. G. (1998). *Does special education raise academic achievement for students with disabilities?* National Bureau of Economic Research Cambridge, Mass., USA.
- Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of public economics*, 95(7-8), 798-812.
- Hedges, L. V, & Hedberg, E. C. (2007). Intraclass correlation values for planning group-randomized trials in education. *Educational Evaluation and Policy Analysis*, 29(1), 60–87.
- Hermanto, B. (2020). Perencanaan sistem pendidikan nasional untuk mencerdaskan kehidupan bangsa. *Foundasia*, 11(2).
- Hoxby, C. M. (2003). *School choice and school competition: Evidence from the United States*.
- Irianto, H. A. (2017). *Pendidikan sebagai investasi dalam pembangunan suatu bangsa*. Kencana.
- James, E., King, E. M., & Suryadi, A. (1996). Finance, management, and costs of public and private schools in Indonesia. *Economics of Education Review*, 15(4), 387-398.
- Kao, C., & Liu, S.-T. (2007). Data envelopment analysis with missing data: a reliable solution method. *Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis*, 291–304.
- Karsidi, D. R. (2005). *Sosiologi pendidikan*.
- Koswara, R. (2014). Manajemen pelatihan life skill dalam upaya pemberdayaan santri di pondok pesantren. *Empowerment: Jurnal Ilmiah Program Studi Pendidikan Luar Sekolah*, 3(1), 37–50.
- Kumala, V. M., Susilo, J., & Susanto, R. (2018). Hubungan Pengetahuan Pedagogik Dengan Kompetensi Pedagogik Serta Perbedaannya Di Sekolah Negeri Dan Sekolah Swasta. *Hub. Pengetah. Pedagog. dengan akaompetensi Pedagog*, 1-23.
- Lindsay, G. (2007). Educational psychology and the effectiveness of inclusive education/mainstreaming. *British Journal of Educational Psychology*, 77(1), 1–24.
- Lubienski, C. A., & Lubienski, S. T. (2013). *The public-school advantage: Why public schools outperform*

- private schools*. University of Chicago Press.
- Otieno, K. O. (2010). Teaching/learning resources and academic performance in mathematics in secondary schools in Bondo District of Kenya. *Asian social science*, 6(12), 126.
- Patrinos, H. A., Osorio, F. B., & Guáqueta, J. (2009). *The role and impact of public-private partnerships in education*. World Bank Publications.
- Stofkova, Z., & Sukalova, V. (2020). Sustainable development of human resources in globalization period. *Sustainability*, 12(18), 7681.
- Suwartini, S. (2017). Pendidikan karakter dan pembangunan sumber daya manusia keberlanjutan. *Trihayu: Jurnal Pendidikan Ke-SD-An*, 4(1).
- Thieme, C., Giménez, V., & Prior, D. (2012). A comparative analysis of the efficiency of national education systems. *Asia Pacific Education Review*, 13, 1–15.
- Trechsel, L. J., Zimmermann, A. B., Graf, D., Herweg, K., Lundsgaard-Hansen, L., Rufer, L., ... Wastl-Walter, D. (2018). Mainstreaming education for sustainable development at a Swiss university: Navigating the traps of institutionalization. *Higher Education Policy*, 31, 471–490.
- Witte, K. D., & López-Torres, L. (2017). Efficiency in education: a review of literature and a way forward. *Journal of the Operational Research Society*, 68(4), 339-363.
- Yaacob, N. A., Osman, M. M., & Bachok, S. (2014). Factors influencing parents' decision in choosing private schools. *Procedia-Social and Behavioral Sciences*, 153, 242-253.
- Zyngier, D. (2014). Class size and academic results, with a focus on children from culturally, linguistically and economically disenfranchised communities. *Evidence Base: A Journal of Evidence Reviews in Key Policy Areas*, (1), 1-24.