International Journal For Research In Educational Studies

GREEN PUBLICATION

ISSN (Online): 2208-2115
Volume 10 Issue 02 June 2024
Available on-line at: https://ijfres.com/index.php/es/issue/view/555

DOI:*https://doi.org/10.53555/es.v10i2.2519* *Received: 27-Mar-2024 Accepted: 27-May-2024*

ENROLLMENT, GRADE STRUCTURE, AND TEACHER CAPACITY IN PRIVATE SCHOOLS

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Abstract
This study investigates the association among enrollment, grade composition, and teacher capacity in private schools based on a school-level quantitative research design. The study relies on a refined secondary data set of about 110 private schools to use a descriptive and correlational research design to examine patterns of institutions and resource allocation. Enrollment is theorized as a measure of school size and demand, whereas grade structure is measured using grade span, and the number of full-time teachers measures teacher capacity. The results show a large range of differences in enrollment of the schools in the private sector, meaning that the institutional sizes are widespread. Descriptive analysis indicates that teacher capacity is quite varied with the level of staffing varying widely across schools. Correlation analysis shows that there is a strong positive correlation between enrollment and teacher capacity which means that bigger schools are likely to hire more teachers. Nevertheless, differences in student-teacher ratios reveal discrepancies in staffing effectiveness, which means that the distribution of resources is not equally consistent with institutional need. The research comes to the conclusion that staffing in private schools should be effectively realized on the congruence of enrollment and grade structure. The research offers a contribution to the improved comprehension of the interaction between structural and resource factors in private education by offering school-level empirical evidence. The implications of the findings are in the management and planning of the school policies to enhance resource efficiency and instructional capacity.

Keywords: *Teacher Capacity; Student-Teacher Ratio; School-Level Analysis; Educational Resource Allocation;Private Schools.*

1. Introduction

Academic achievement is commonly accepted as one of the most important parameters of educational achievement and one of the main results of the educational process. It is not only a measure of the cognitive abilities of students but also the impact of the different environmental, social and educational factors. The need to comprehend the determinants of student performance, especially in disciplinary subjects like mathematics, reading, and writing, has been on the increase over the last few years. These topics are the basis of the educational growth and are very important in determining the future academic and professional prospects. There is a body of evidence indicating that student achievement is not a result of one factor but a combination of several factors that are interrelated. Ali et al. (2023) stress that the combination of genders, parenting styles, and socioeconomic conditions influences the academic performance. Similarly, Kocak et al. (2021) also underline that academic achievement is a multidimensional notion that is influenced by demographic, psychological, and contextual determinants. This complexity shows that it is necessary to weigh up several factors simultaneously in order to have a holistic view of student performance.

One of the factors that has always been identified as a determinant of academic performance is socioeconomic status. Harris (2023) notes that students whose socioeconomic status tends to be more privileged have higher chances of academically performing better due to access to better educational opportunities and learning circumstances. That this observation is supported by Chmielewski (2019), who documents the fact that differences in socioeconomic achievements have been increasing over time around the world indicates that disparities in educational outcomes remain a problem. In addition, Yousif et al. (2023) have found out that socioeconomic factors substantially impact academic performance, particularly in terms of access to learning opportunities and academic support. These findings highlight the need to address socioeconomic inequalities in a bid to improve the overall performance in education. The role of parental involvement and educational background as well is also an important factor in determining student achievement. According to Sengonul (2022), active parental involvement is positively linked to improved academic performance, especially in the presence of a positive socioeconomic background. In addition, the student outcomes are highly influenced by parental expectations and the educational level. Zhang et al. (2023) show that parental educational expectations are influenced by socioeconomic status and they consequently influence the academic motivation and performance of students. The results indicate that family-related aspects are key in explaining differences in student performance.

There is also a well-documented gender difference in academic achievement in research into education. Research shows that there usually exists a variation in performance pattern between subjects and that differences are found in both cognitive and behavioral aspects. However, Ali et al. (2023) emphasize the role of gender in academic outcomes that can be positive or negative depending on the subject and other contextual characteristics. These differences are significant in understanding the learning needs of learners and how to develop specific instructional strategies that can be used to meet the needs of different learners. Besides demographic and socioeconomic factors, psychological and academic factors are also known to affect the performance of students. As an example, Kaushal et al. (2022) single out mathematics anxiety as a major determinant of mathematics achievements, proving that emotional and cognitive elements may have an impact on learning. These results underscore that external conditions are not the only determinants of academic performance but in-house psychological processes too.

Although academic achievement has been well studied, there is a need to conduct studies that incorporate various factors in one analytical framework, especially with the use of easy-to-access and representative datasets. The current research seeks to analyze the variables that relate to student performance in mathematics, reading, and writing. In particular, it aims to examine gender differences in academic achievement and explore the impact of socioeconomic status, as measured by the type of lunch, on student achievement. The research also seeks to determine the influence of parental education on the growth of academic performance and to determine the effects of test preparation on the performance of the student. Moreover, it analyzes the correlation between reading and writing scores to get an idea of the interdependence of academic outcomes related to literacy. All in all, the current study can be viewed as part of the existing body of literature as it provides empirical information on the determinants of student achievement. The results are likely to guide the educators and policymakers to develop strategies that facilitate the realization of equitable and effective learning settings, which will eventually improve student performance in the major academic spheres.

2. Methodology

2.1 Research Design

The research design applied in this study is a quantitative, descriptive and correlational research design to investigate the patterns and relationships of enrollment, grade structure and teacher capacity in the private schools. The design suits the analysis of numerical data on an institutional level and the identification of relationships between the variables of interest without the use of an experiment. Through the concentration on observable school features, the study will be able to produce empirical data on how the interaction of structural and resource-related factors in the context of the private educational environment works.

2.2 Data Source and Sample

A secondary dataset of the private schools is used in this analysis, which has been narrowed down systematically to ensure the quality of the data and relevance of the analysis. The last dataset will be made up of about 110 private schools, which will be an independent unit of analysis. To ensure consistency and validity, the dataset was narrowed with the help of particular inclusion criteria (Larxel, 2020). The schools that had positive number of students enrolled and had at least one

full-time teacher were considered only. Also, records that had inconsistent grade structures i.e. the final grade was less than the initial grade were not included. This process ensured that the data set is a good representation of the functional schools with sound structural and staffing data.

2.3 Unit of Analysis

The unit of analysis in this study is the individual private school. The data is a single observation per school and includes data relevant to the enrollment size, grade coverage, and teacher staffing. The school-based method enables the identification of trends and the disparities across schools that enable a better interpretation of the relationship between enrollment and institutional characteristics and the ability to staff.

2.4 Variables and Operational Definitions

The study examines three key constructs, which include enrollment, grade structure and teacher capacity. Enrollment is calculated as the total number of students enrolled to each school and is a measure of the size of the institution and demand. The grade structure is operationalized using two variables: the grade level which is the initial grade and the final grade that is offered by a given school which is used to determine the breadth of the level of education. The teacher capacity is measured by the number of full-time teachers in a school and this is used to determine the number of staffing resources that a school has to provide instruction.

Two derived variables were created to aid further analysis. The grade span is calculated as follows; the final grade minus the initial grade which provides a clue of the grade coverage in each school. In addition, the student teacher ratio (STR) is determined by dividing the total enrolled by the full-time teachers. The sufficiency of the staffing and the distribution of instructional workloads can be represented by the ratio.

2.5 Data Preparation and Cleaning

For achieving correctness and integrity in the process of analysis, it was important that the data should have been properly preprocessed and then analyzed. It was necessary to eliminate those data records that did not have any value or showed zero for the number of enrollments and teachers as these are not examples of functioning schools. In addition, those data sets which had irregularities in the grades were eliminated in order to maintain structural validity. The next step was to compute some additional variables like grade span and student-teacher ratio.

2.6 Analytical Techniques

The data was analyzed through the use of statistical techniques in the form of spreadsheets, where the main program used was Microsoft Excel due to being an exploratory and applied research. For purposes of describing school sizes regarding enrollment, capacity of teachers and grade range, measures of central tendency like mean, median, mode and measures of variability including standard deviation, minimum and maximum figures were derived. Frequencies of schools were calculated in accordance to the size of their enrollments and grades coverage, thereby enabling identification of most prominent structural trends.

Association strength and direction between variables enrollment and capacity of teachers were determined through Pearson correlation analysis. This will shed light into whether staff increases proportionately with the number of students. Further, cross-tabulation techniques were used to explore the variability of grade structures across different types of schools, and how the structural differences in grades relate to teacher staffing. In the event that it is relevant, a simple linear regression model can be used to further examine the prediction relationship between enrollment and teacher capacity.

2.7 Ethical Considerations

The research involves secondary, non-identifiable institutional data, which means that no personal or sensitive data is used. All the data are related to school-level characteristics and are not utilized in any other way, only in academic and research purposes. The research is conducted in compliance with the conventional ethical standards such as privacy, responsible data management, and academic honesty.

3. Results and Analysis

3.1 Descriptive Statistics

The descriptive statistics of the key variables that will be analyzed in this study, i.e., enrollment, full-time teachers, grade span, and student teacher ratio are given in Table 1. The results show that there is a significant difference among the sampled private schools. The mean and median of enrollment were 172.33 and 72.00 respectively with a standard deviation of 404.17 indicating a highly dispersed enrollment. The lowest enrollment was 1 student and the highest was 3,933 students, which means that there were very small and very large institutions in the sample. The number of full-time teachers was the teacher capacity with a mean of 21.75 and a median of 9.00 with a minimum of 1 teacher and a maximum of 361 teachers. The high standard deviation (46.36) also supports the idea that there are significant differences in the level of staffing across schools.

Table 1. Descriptive Statistics of Key Variables

Variable	Count	Mean	Median	SD	Min	Max
Enrollment	110.0	172.33	72.00	404.17	1.00	3933.0
Full-Time Teachers	110.0	21.75	9.00	46.36	1.00	361.0
Grade Span	110.0	8.02	10.00	4.87	0.00	15.0
Student-Teacher Ratio	110.0	17.61	9.04	37.93	0.04	278.0

The mean grade range was 8.02, the median was 10.00 and the standard deviation was 4.87, so most schools provided instruction over a fairly wide grade range. The grade spans were 0 to 15 and this showed a structural diversity in the school coverage of the private schools. The student-teacher ratio was 17.61 with a median of 9.04 and a standard deviation of 37.93. The range of the ratio was between 0.04 and 278.00, which indicates that there is a significant difference in staffing efficiency and indicates that some schools can be either overstaffed in comparison to enrollment or have a relatively high instructional pressure. On the whole, the descriptive portrait shows significant heterogeneity of the sample of the private schools in terms of school size, staffing capacity, and grade structure (Table 1).

3.2 Enrollment Distribution

Table 2 shows the distribution of schools according to enrollment category. Schools were categorized as small, medium and large using the classification criteria of the study. The results show that small schools constituted the majority of the sample, with 73 schools, representing 66.36% of all institutions. The number of medium-sized schools was 30 or 27.27, and the number of large schools was quite small, with just 7 schools, which constituted 6.36 of the sample.

Table 2. Distribution of Schools by Enrollment Category

Enrollment Category	Frequency	Percentage
Small	73	66.36
Medium	30	27.27
Large	7	6.36

This distribution implies that smaller institutions prevail in the current dataset of the private schools. The fact that the small schools prevail points to the fact that the small-scale education in the sampled environment is highly marked by small student numbers, and very large institutions are still relatively rare. This trend has significance in the interpretation of subsequent results on staffing and efficiency since the school size will most probably influence the teacher distribution and the use of resources is shown in Figure 1.

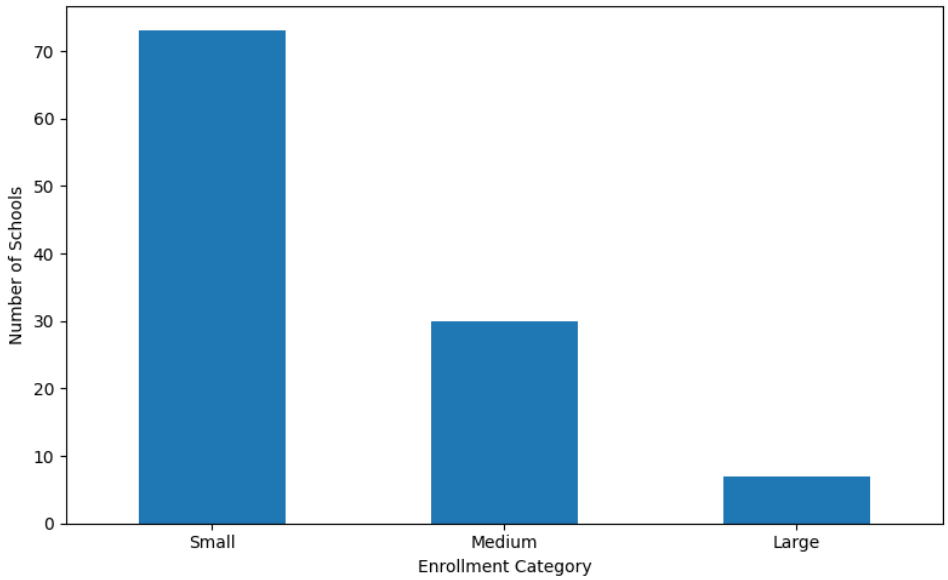

Figure 1. Distribution of schools by enrollment category

3.3 Grade Structure Analysis

Table 3 shows the distribution of schools according to the grade structure. Grade span was used to categorize schools into three groups, namely, primary, secondary, and combined. The findings show that combined schools represented the most

significant group, 58 schools, which comprised 52.73% of the overall sample. Primary schools took 33 schools or 30.00 and secondary schools took the lowest numbers with 19 schools or 17.27.

Table 3. Distribution of Schools by Grade Structure

Grade Structure	Frequency	Percentage
Primary	33	30.00
Secondary	19	17.27
Combined	58	52.73

The median grade span of 8.02 mentioned above also confirms the assumption that the number of grade levels represented by many of the private schools in the sample is not restricted to one educational level. The prevalence of combined schools implies that a good percentage of privately-run institutions is structurally designed to offer a wider educational scope, which can add to the administrative and staffing complexity. This organizational trend implies that in many cases, private schools combine several levels of education in one institutional environment and do not operate as either primary or secondary institutions shows in Figure 2.

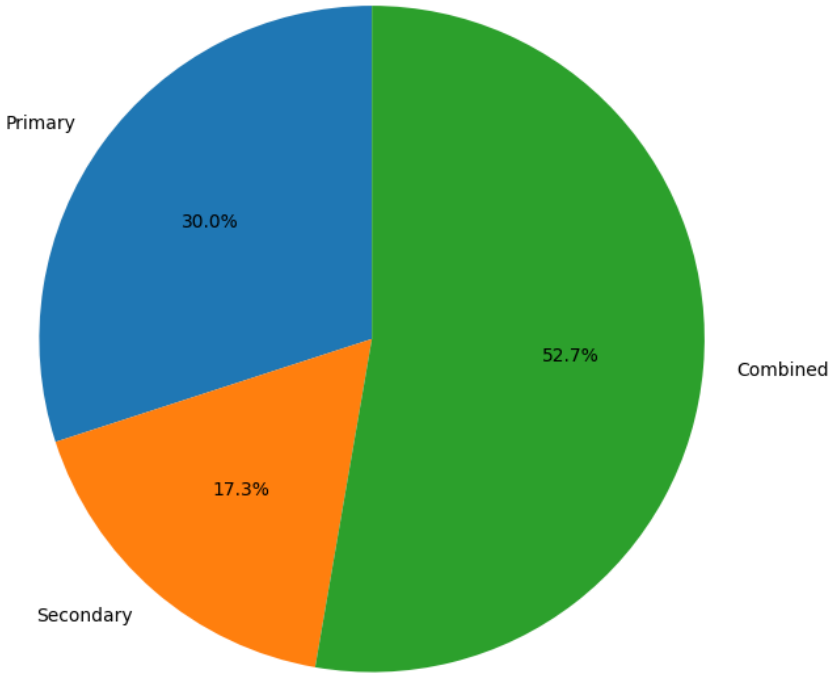

Figure 2. Distribution of schools by grade structure

3.4 Teacher Capacity Patterns

There was a significant difference in teacher capacity across sampled schools. Table 1 illustrates that the average number of full-time teachers was 21.75, but the median of 9.00 suggests that numerous schools had fewer than the general average number of staff. The difference between the mean and the median indicates that the distribution of the number of teachers was positively skewed, with a few schools having very large teaching staffs.

The difference in teacher capacity by the enrollment categories further illuminates this. Small schools had an average of 8.41 full-time teachers on average, medium-sized schools had an average of 33.77 on average, and large schools had significantly higher at 109.43. This trend indicates clearly that the capacity of teachers increases with the increase in enrollments. The extremely large standard deviations in the medium (48.63) and large (119.05) school categories, however, suggest that there is no consistency in staffing levels even among schools of similar size. These differences imply that schools can adopt differing staffing models or have varied degrees of resource availability.

It also seems that the structural complexity of the school influences teacher capacity. As combined schools make the highest percentage of the sample, and the average grade span is over eight grades, it is plausible to conclude that a larger grade coverage would necessitate a larger staffing structure. Multigrade schools will have more teaching staffing needs compared to those with a smaller grade range because they will need a more varied teaching staff.

3.5 Relationship Between Enrollment and Teacher Capacity

Pearson correlation analysis was used to determine the relationship between teacher capacity and enrollment. The findings indicate that there is a strong positive relationship between the number of full-time teachers and enrollment ($r = 0.804$), which means that schools with a greater number of students tend to hire more teachers. This result indicates that staffing is more likely to rise with enrollment growth indicating a relatively proportional relationship between school size and teacher capacity.

Meanwhile, the correlation is not 1:1, which means that staffing does not increase evenly across schools. Certain institutions seem to have a relatively higher staffing as compared to enrollment, and others have less staffing than one would expect based on their student population. The trend indicates that disproportional staffing can occur in some situations, and it can be determined by the grade structure, institutional priorities, or resource limitations. However, the general direction proves the idea that enrollment is a significant factor in determining teacher capacity in the private schools, as shown in Figure 3.

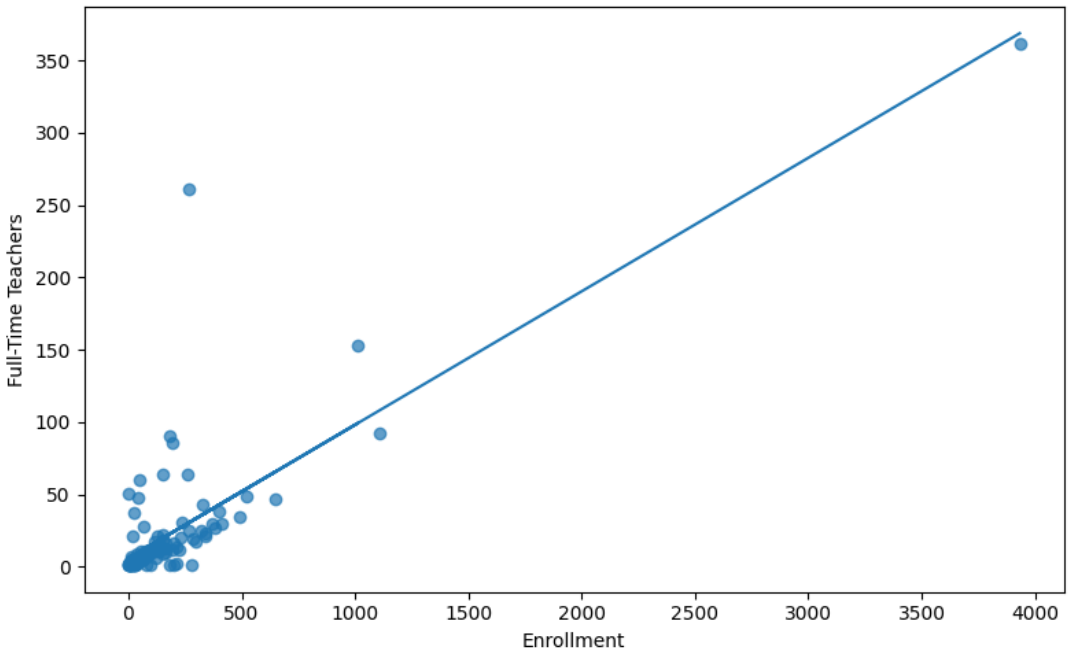

Figure 3. Relationship between enrollment and full-time teachers in private schools

3.6 Efficiency Indicator: Student–Teacher Ratio

The student-to-teacher ratio gives further understanding of the effectiveness and sufficiency of staffing processes in schools. According to Table 1, the average student-teacher ratio was 17.61, and the median was 9.04, which once again indicates a positively skewed distribution. The lowest ratio of 0.04 means that there are schools with extremely low student-staff ratios, and the highest ratio of 278.00 is indicative of incredibly high instructional pressure in a few cases.

The large range in the student-teacher ratio as indicated by a standard deviation of 37.93 indicates that the staffing is not very efficient in all private schools. Schools that have relatively balanced ratios could be in a better position to offer manageable teaching conditions whereas those with extreme ratios may experience either under-utilization of staff or overworked teachers. These results, when combined with the allocation of enrollment and teacher capacity, indicate that there is an uneven distribution of resources in schools. Specifically, schools with more comprehensive grade structures and larger enrollment sizes might be in a better position to maintain more balanced staffing patterns, and small schools may have high inefficiencies because of their small scale and fluctuating staffing needs. It can be concluded from the findings above that there is diversity in terms of the sizes of the private schools, as well as the organizational structures and the staff. The capacities of the teachers are highly associated with the number of students in each school, while the large variation in the ratios indicates differences in staffing efficiency among the schools.

4. Discussion

These findings are very useful in terms of the link between enrollment, grade structure, and staffing capacity in the private schools. Firstly, one of the remarkable outcomes of the analysis was a high positive correlation between enrollment and staffing capacity, meaning that larger schools employ more teachers. Such an outcome corresponds to the existing research literature on teacher labor market, which states that the level of staffing is associated with demand and the size of educational institution (Diliberti & Schwartz, 2023; Goldhaber & Theobald, 2022). The increase in enrollment makes schools develop staffing capacity in order to maintain instructional activities. At the same time, the growth in staffing capacity may be uneven.

Grade structure was also proved to have an impact on staffing diversity and complexity. Private institutions with a higher-grade span, especially those regarded as joint institutions, should have staffing capacity that includes teachers at several levels of instruction. The explanation for the mentioned result comes from the research on grade configuration that demonstrates how organizational structure influences the process of planning instructional activities and staffing needs (Schwartz et al., 2016; Torry, 2020). As a consequence, educational institutions, depending on their grade span, should hire appropriate staffing.

In addition, the results reveal that the ratios between students and teachers vary from one school to another. In other words,

it suggests inefficiency in the resource allocation within schools. While there are schools where there is adequate staffing, there are some that appear to have an excessive amount of teaching force, while there are also those that experience high levels of instructional demand. Such differences reveal underlying problems relating to staffing and teacher recruitment that have been identified by researchers in various literatures (Carver-Thomas & Darling-Hammond, 2019; Johnson, 2022). Such discrepancies could be caused by different factors such as managerial issues of institutions, monetary capacity of institutions, or the labor market locally, which means that staffing policies cannot only depend on enrollment alone.

The implications of the findings of this study are significant to both the school-level management and education policy. On the institutional level, the findings highlight the importance of balanced staffing policies to match teacher capacity with enrollment size and grade structure. Schools should also be very careful when planning their workforce so that the level of staffing is adequate to cater to the instructional needs without causing inefficiencies. Staffing, especially, is essential in ensuring a manageable number of students in classes and in facilitating student learning outcomes (Blatchford & Russell, 2019; Wu et al., 2022).

The policy implications of the identified difference in teacher capacity and student teacher ratios are that it is necessary to set explicit policies on how to distribute teachers. Enrollment and structural considerations should be taken into account by policymakers in designing staffing frameworks in order to have equitable distribution of resources in schools. Moreover, it is also necessary to track the distribution of resources in the privately-operating schools in order to detect inequalities and enhance the efficiency of the system. The frameworks of performance management and accountability in the context of the public sector could provide helpful insights into the enhancement of resource use in the education system (Cepiku, 2021).

Moreover, the results highlight the importance of considering wider workforce issues, such as teacher retention and mobility. The increase in teacher turnover and labor market variability may also have a substantial effect on the staffing stability and capacity, especially in schools with scarce resources (Goldhaber & Theobald, 2022). To solve these problems, coordinated policy action is necessary to enhance working conditions, and assist teachers to overcome these challenges, which is the aim of this study to offer empirical evidence on the relationship between enrollment, grade structure and teacher capacity at the school level in the private schools. Although a lot of the current literature concentrates on either system-level or policy-based analyses, the current paper provides a micro-level view that emphasizes variation at the individual institution level. This study provides new insights into the existing knowledge base regarding how institutions satisfy their demands through the resource acquisition processes in private schools by establishing a relationship between structure and staff hiring.

In addition, this study brings together the perspectives from different areas of education research that include teacher labor market theories and school organizations. Analyzing these factors within one piece of analysis, it offers a more holistic picture of how learning institutions operate and adjust to the evolving circumstances (Monarrez et al., 2020; Woessmann, 2018). It is especially applicable to the growing systems of private education, where knowledge about the internal processes is essential to enhancing performance and equity (Ashley et al., 2020).

Although it has contributed to it, the study has a number of limitations that must be considered. To begin with, teacher capacity is only measured in terms of full-time teachers, which fails to bring out qualitative issues related to the qualifications, experience, or instructional performance of teachers. Second, the data lacks measures of student results or student performance, which restricts the possibility to determine how staffing patterns affect education quality. Third, the findings could be limited by the relatively small sample size of around 110 schools. Last, due to the cross-sectional character of the data, the analysis is limited to observed relationships and causal inferences are not possible.

The next phase in research should seek to expand upon these findings by including more variables that represent the qualitative aspects of teacher capacity including, qualifications, training and experience. The inclusion of student outcome measures would also give a more in-depth view of the effect of staffing patterns on education. Longitudinal studies are especially relevant to the analysis of the change in enrollment, grade structure and teacher capacity over time, and the determination of a causal relationship between these variables.

Additionally, future studies might examine how institutional and policy factors such as funding systems, governance systems, and market forces affect the staffing patterns. It would be beneficial to extend the analysis to other educational contexts to increase the generalizability of the results and develop a deeper insight into the functioning of private schools.

5. Conclusion

This study examined the relations between enrollment, grade structure and teacher capacity in the private schools using the school-level data. The findings indicate that the enrolments are significantly different across the private schools, which is a considerable difference in the size and the demand of a school. This diversity suggests that there is indeed a unique aspect concerning the organization of private education institutions where schools are characterized by varying resources and organizational arrangements. It is also revealed that the grade structures differ greatly where there is a large population of schools with many grade structures. This diversity in organizational aspects implies that the organizational structure that has been used for the organization of the private schools is quite flexible, where a variety of educational levels can thus be incorporated into a single organization. There are important consequences concerning the differences in grade structures since the staffing will also depend on this. Among the findings of the research is the fact that the teacher capacity is related to the enrollment in that staffing of schools tends to increase with increases in enrollment. However, there is also a variation in the student-teacher ratio which shows that there may not be any direct relationship. This reveals that there may be variations in resource allocation and utilization. In all these cases, it is imperative that staffing must be

determined based on the size of schools and the grade level covered by schools.

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