A Comparative Study of University Admission Cutoff Z-Scores within the Physical Science Stream in Educationally Advantaged and Disadvantaged Districts in Sri Lanka with a Specific Emphasis on Engineering, Physical Science, Computer Science, and Applied Science Disciplines

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ABSTRACT

In Sri Lanka, assurance of fair educational opportunities remains a prime concern in university admissions from both educationally advantaged and disadvantaged districts. This study discusses whether the prevailing university admission process, along with cutoff Z-score calculation, the District Quota System (DQS), and the Preference Matrix, efficiently bridges the prevailing disparities, initially focusing on students' admission to the main degree programs in the Physical Science stream. It was tested whether there is any significant difference in the cutoff Z-scores between these two district categories. The study seeks to investigate whether there is any difference in university admission disparities based on four major degree programs: Engineering, Physical Science, Computer Science, and Applied Science. Descriptive statistics, with cutoff Z-score records from University Admissions Handbooks, 2017–2023 were used in the analysis. Weighted averages and statistical tests were conducted to investigate the relationship between cutoff Z-scores, district classifications, universities, and academic years. The findings showed no significant difference in the cutoff Z-scores for the Engineering and Computer Science degree programs, meaning fair opportunity. However, large differences were recorded in Physical Science and Applied Science degree programs, where the Z-scores for the advantaged districts were higher. Also, there were no significant differences across the four-degree programs when considering changes across the academic years, indicating that temporal factors have not impacted on the existing disparities or consistencies. From these results, while fairness is attained under the current system in some degree programs, targeted interventions are needed in other degree programs where inequalities persist. Evidence also suggests that there is a gradual increase in merit-based selection for streams such as Engineering and Computer Science, supplemented by efforts to improve educational facilities in disadvantaged districts.

Keywords : Cutoff Z-score Analysis; advantaged & disadvantaged districts; University Admissions; Higher education; Educational Disparities

INTRODUCTION

Degree programs in the physical science stream, such as Engineering, Physical Science, Computer Science, and Applied Science, are becoming more and more popular among students because they generate professionals with a strong background in mathematics who can meet local and international industry demands.

This study examines the university admission cutoff Z-scores from the academic years 2017 to 2023 within the Engineering, Physical Science, Computer Science and Applied Science degree programs to assess the efficacy of the existing university admission process in educationally disadvantaged districts [3]. Key institutions for Engineering include University of Moratuwa (UOM), University of Peradeniya (UOP), University of Sri Jayewardenepura (USJP), University of Ruhuna (UOR), University of Jaffna (UOJ), and Southeastern University of Sri Lanka (SEUSL). In the field of Physical Science, students apply to the University of Colombo (UOC), UOP, USJP, University of Kelaniya (UOK), UOJ, UOR, Eastern University of Sri Lanka (EUSL), and SEUSL. Computer Science degree programs are offered by UOK, UOJ, UOR, University of Colombo School of Computing (UCSC), EUSL, and USJP. Applied Science are available at Rajarata University of Sri Lanka (RUSL), Sabaragamuwa University of Sri Lanka (SUSL), Wayamba University of Sri Lanka (WUSL), UOJ, and EUSL [3].

Educationally disadvantaged districts include Ampara, Anuradhapura, Badulla, Batticaloa, Hambantota, Jaffna, Kilinochchi, Mannar, Monaragala, Mullaitivu, Nuwara Eliya, Polonnaruwa, Puttalam, Ratnapura, Trincomalee, and Vavuniya. Educationally advantaged districts include Colombo, Galle, Gampaha, Kalutara, Kandy, Kegalle, Kurunegala, Matale, and Matara [3].

With that, determining the cut off Z-score, District Quota System (DQS), and Preference Matrix will raise the question on the need to lessen disparities in higher educational opportunities throughout the country [2]. First, this system standardized student performance on the GCE (A/L) in different subjects to a mean of zero and standard deviation of one allowing fair comparisons among students in different subjects which may differ in their level of difficulty [2]. Selection of students into the universities shall be on merit and the opportunity under DQS would provide an equal chance for access to higher education to students from less privileged educational districts whereby university placement will be allocated at both district quota levels and national merit levels.

It shows how different practitioners cut off Z-scores across different districts and universities. This study would conduct analysis of cutoff Z-scores by course and district, with the aim of understanding what implications this might have for educational policy and fairness in university admission throughout Sri Lanka.

MATERIAL & METHODS

The design of the current study adopted a descriptive analysis to analyze disparities in university admission cutoff Z-scores between educationally disadvantaged and advantaged districts. Data were collected from the University Admissions Handbooks published on the UGC website for five consecutive academic years during the period from 2017 to 2023. In all, cutoff Z-score records for four key degree programs, 1200 students from Engineering, 1600 from Physical Science, 1200 from Computer Science, and 1200 from Applied Science, were selected using purposive sampling to represent both categories of districts.

Continuous and discrete variables in the dataset included cutoff Z-scores, district population, weighted average cutoff Z-scores, district classification, universities, degree programs, and academic years. Various statistical tests, including ANOVA using General Linear Model (GLM), were performed for these relationships. Trends in cutoff Z-scores were analyzed to compare the different categories of districts. Data cleaning was performed for No Qualified Candidates (NQC) cases, and weighted averages had been used to represent Z-scores correctly, considering the population variability across different districts. This analysis allowed a detailed look into the relationships and disparities that exist in university admissions outcomes.

RESULTS & DISCUSSION

The analysis tested the hypothesis of statistically significant differences in cutoff Z-scores between educationally disadvantaged and educationally advantaged districts, without consideration of differences in university or academic year. The study shows some mixed results across the four main degree programs examined.

Table I indicates that on the Engineering and Computer Science degree programs there is no statistically significant difference between the Z-scores of students from educationally disadvantaged districts and those from educationally advantaged districts. The p-values for these courses are 0.505 and 0.218, which are greater than the significance level of 0.05. As a result, we fail to reject the null hypothesis (H0: There is no significant difference in the mean Z-scores between educationally disadvantaged and educationally advantaged districts). According to the findings of this study, it is apparent that district privilege does not significantly affect the selection of students to these two-degree programs.

However, for both the Physical Science and Applied Science degree programs, the p values are 0.000, which is even less than the significance level of 0.05. Therefore, the null hypothesis can be rejected, and thus we can conclude that there is a statistically significant difference in the Z-scores of students from educationally disadvantaged and educationally advantaged districts admitted to in these two-degree programs. These results suggest that there exist statistically significant disparities in university admission to these two-degree programs and recommend the authorities make appropriate policy changes in the admission criteria to ensure future fair access to the two disciplines Physical Science and Applied Science.

Table I Paired T-Test and Ci for Disadvantaged – Advantaged Districts

| Discipline	District Type	Mean	St Dev	Difference	P-Value
Engineering	Disadvantaged Districts	1.6247	0.3625	-0.0168	0.505
	Advantaged Districts	1.6415	0.3191		
Physical Science	Disadvantaged Districts	0.8829	0.4401	-0.0634	0
	Advantaged Districts	0.9463	0.3875		
Computer Science	Disadvantaged Districts	1.2645	0.4052	-0.033	0.218
	Advantaged Districts	1.2975	0.3176		
Applied Science	Disadvantaged Districts	0.667	0.3914	-0.0887	0
	Advantaged Districts	0.7557	0.3335		
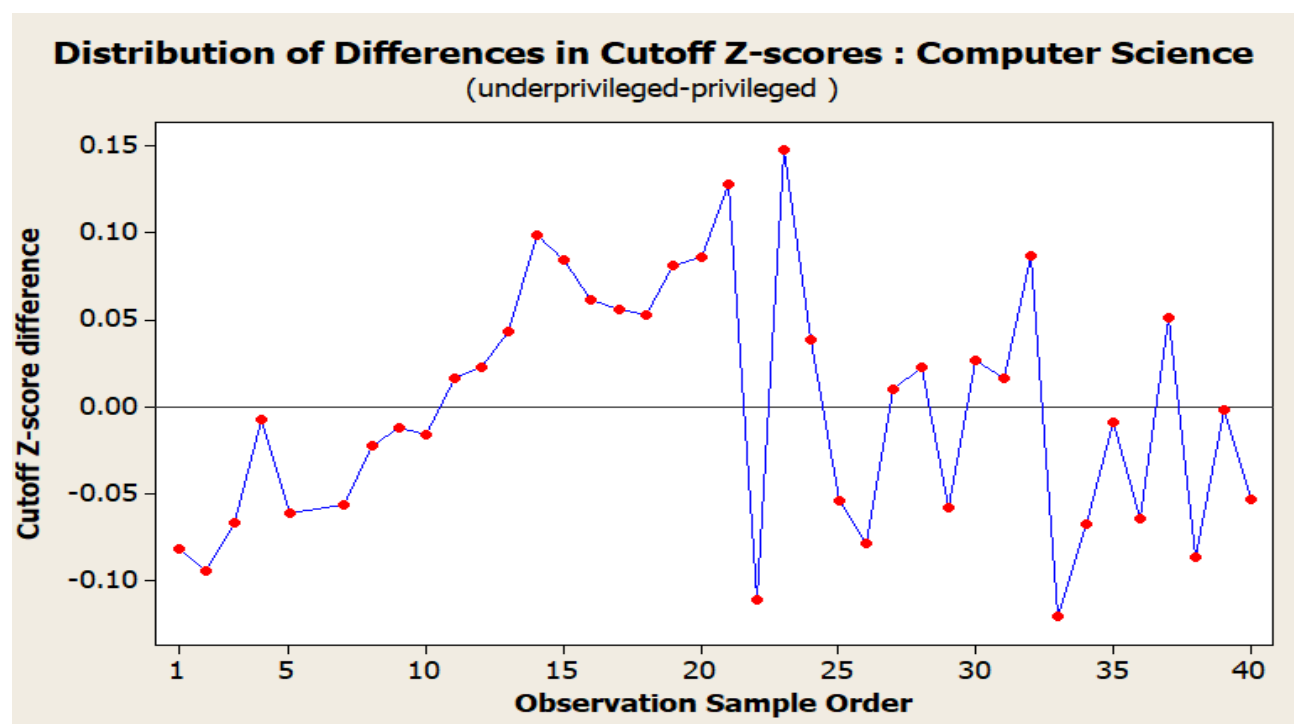
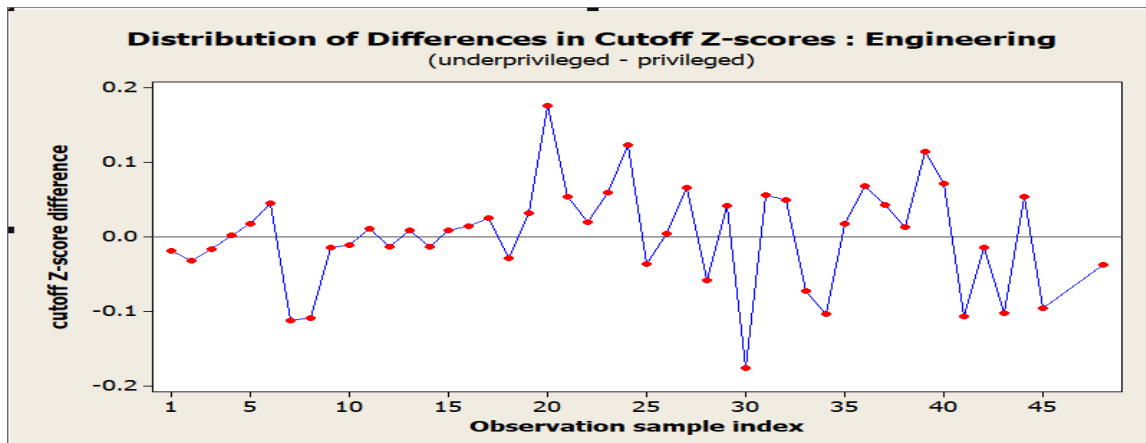Fig. 1 Distribution of Differences in Cutoff Z-Scores in Engineering.

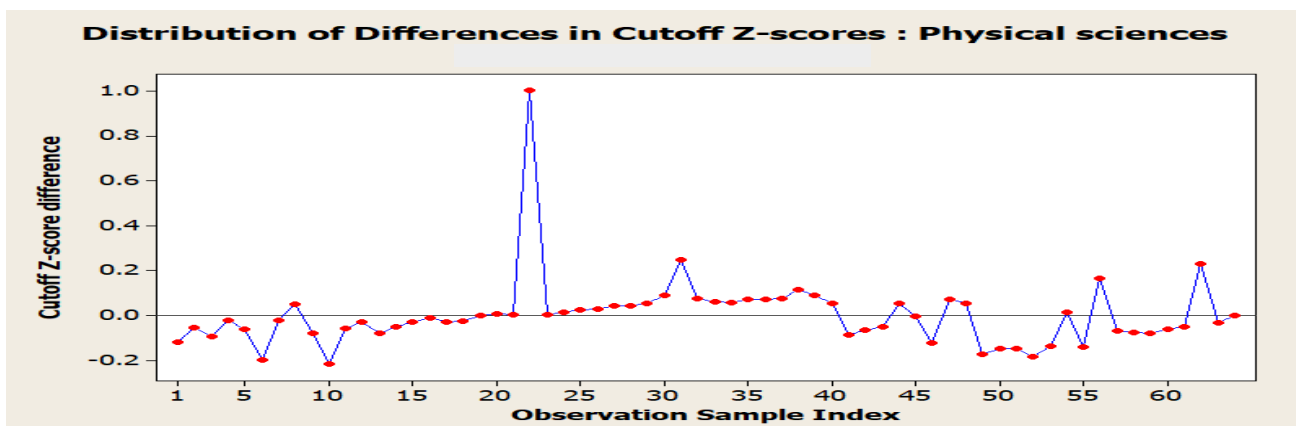Fig. 2 Distribution of Differences in Cutoff Z-Scores

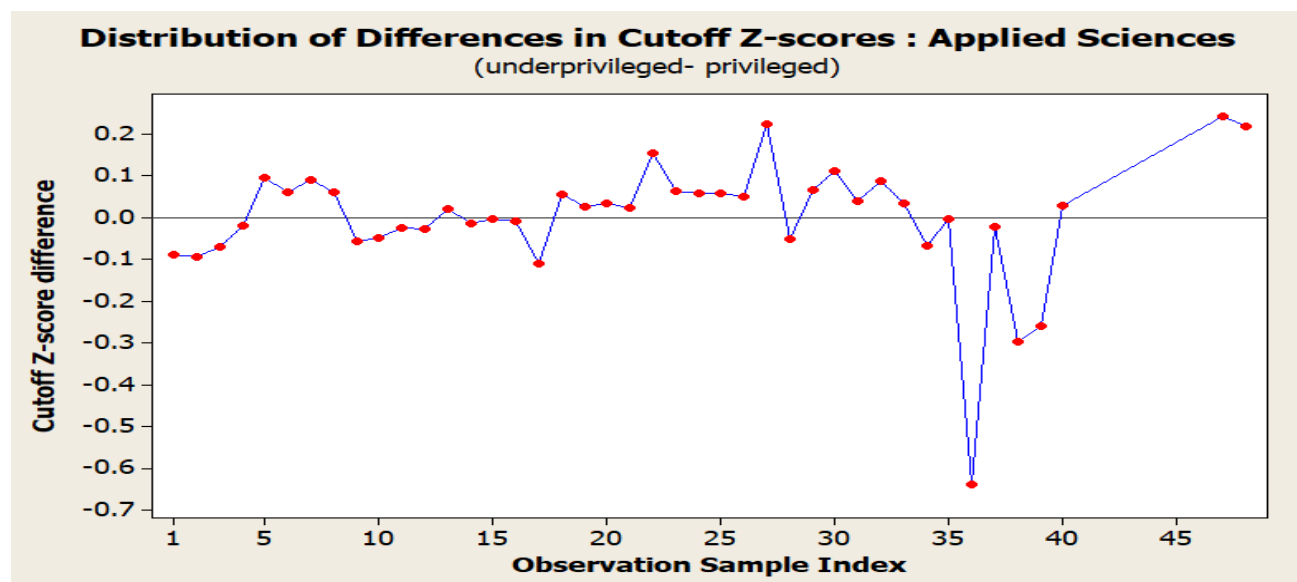Fig. 3 Distribution of Differences in Cutoff Z-Scores in Physical Sciences.

Fig. 4 Distribution of Differences in Cutoff Z-Scores in Applied

In the next part of this analysis, an ANOVA test was conducted to find out whether there is a difference in the cutoff Z-scores for university differences. All the degree programs offered have p values less than 0.05. Therefore, table II suggests that the university to which he/she intends to apply is statistically significant in determining their Z-score. This implies that, the differences between universities are important in explaining differences in Z-scores.

Table II Analysis of Variances Across Universities

	Source	P-Value
Engineering	University Error Total	0.002
Physical Science	University Error Total	0.000
Computer Science	University Error Total	0.000
Applied Science	University Error Total	0.000

Table III Analysis of Variances Across Academic Years

	Source	P-Value
Engineering	Year Error Total	0.954
Physical Science	Year Error Total	0.642
Computer Science	Year Error Total	0.830
Applied Science	Year Error Total	0.984

Applying this model an ANOVA test was conducted to compare the mean cutoff Z-scores variation across years. These are presented in Table III which also shows that p-values for the four-degree programs Engineering, Physical Science, Computer Science, and Applied Science are greater than 0.05 thus suggesting that there is no significant difference in the Z-scores of the degree programs over the analyzed academic years.

The lack of significant differences over time suggests that the variation in cutoff Z-scores between educationally disadvantaged and educationally advantaged districts has remained relatively stable throughout the academic years examined. These findings imply that any existing disparities or consistencies in university admissions outcomes between districts have not been influenced by temporal factors and may not require them to focus on time-based factors such as natural disasters, epidemic diseases, economic crises, and yearly changes in admission policies during the study period.

CONCLUSION

The study has clearly shown that district privilege accounts for a substantive influence on gaining access to some disciplines Applied Science and Physical Science in university admission decisions. The choice of university to which the student seeks to apply also plays a crucial role in determining the Z-score of the student in the admission system. Temporal variables do not influence these differences. The merit-based system in Sri Lanka's university admission, District Quota System (DQS), brings in some complexity in place where a less-crowded district will have fewer placements. The recommendation herein includes starting gradual increases to the percentage of merit in the selection of streams with increasing facilities in educationally disadvantage districts, while gradually applying to 100% merit in all selections for university admission.

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