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ANALYSIS OF FACTORS INFLUENCING THE DEMAND FOR REGIONAL HIGHER MEDICAL EDUCATION SERVICES

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Annotation: The rapid expansion of the global healthcare market has had a profound and unprecedented impact on medical education systems worldwide. The growing demand for medical services, driven by population growth, aging demographics, and advancements in medical technology, has led to a significant shortage of qualified healthcare professionals across the globe. This shortage has, in turn, triggered a series of consequential developments, including a sharp rise in the number of medical educational institutions and an exponential increase in the enrollment of medical students. Additionally, there has been a notable surge in academic migration, with students increasingly crossing borders to pursue medical education in countries and institutions that offer high-quality training and better opportunities. Against this backdrop, the scientific analysis of the factors contributing to the growth in the number of foreign students in higher medical education institutions has emerged as a critical area of research. Understanding these factors is essential for addressing the challenges posed by the global healthcare workforce crisis and for developing strategies to enhance the quality and accessibility of medical education. In light of these considerations, this study focuses on examining the key factors influencing the enrollment of foreign students at the Bukhara State Medical Institute and Samarkand State Medical University. By exploring the institutional, economic, and academic variables that shape the demand for medical education, this research aims to shed light on the complex interplay of factors that drive the demand for medical education and to offer practical recommendations for enhancing the competitiveness and appeal of medical institutions in a region.
Keywords: demand for medical services • foreign students • panel data analysis • regression model • educational infrastructure • statistical significance • international collaboration.

1 Introduction

The Bukhara State Medical Institute and Samarkand State Medical University, as a regional hub for medical education, has witnessed a growing influx of foreign students in recent years. This phenomenon raises important questions about the factors driving this trend and the institutional capacity to accommodate and support international learners. Understanding the determinants of demand for regional higher medical education services is essential for policymakers, educators, and stakeholders to develop strategies that enhance the quality of education, attract global talent, and address the global shortage of healthcare professionals.

This study aims to analyze the factors influencing the demand for higher medical education services at the Bukhara State Medical Institute and Samarkand State Medical University, with a particular focus on the enrollment of foreign students. Using panel data from 2018 to 2023, the research employs advanced econometric techniques, including Ordinary Least Squares (OLS) regression, correlation analysis, and diagnostic tests such as the Shapiro-Wilk test and Breusch-Pagan test, to identify key drivers of foreign student enrollment. The study examines variables such as student-teacher ratios, institutional scientific capacity, contract fees for foreign students, and international collaboration initiatives, among others.

By providing a comprehensive analysis of these factors, this research contributes to the broader discourse on the globalization of medical education and offers evidence-based recommendations

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for enhancing the attractiveness and competitiveness of regional medical institutions. The findings are expected to inform policy decisions and institutional strategies aimed at fostering sustainable growth in medical education, addressing global healthcare workforce shortages, and improving the quality of medical training in an increasingly interconnected world.

2 Methodology

This section outlines the methodology employed in conducting the research, as well as the sources utilized during the preparation of this article. The study is based on a mixed-methods approach, combining quantitative analysis of panel data with statistical modeling to identify and evaluate the factors influencing the demand for higher medical education services at the Bukhara State Medical Institute and Samarkand state medical university.

The methodological framework is designed to ensure the reliability and validity of the findings, adhering to established academic standards.

The research relies on secondary data obtained from the archives of the Bukhara State Medical Institute and Samarkand State Medical University, covering the period from 2018 to 2023. The dataset includes information on key variables such as the number of foreign students, student-teacher ratios, scientific capacity, contract fees for foreign students, and institutional infrastructure. Additionally, data on international collaborations, publications in Scopus-indexed journals, and participation in academic exchange programs were collected to provide a comprehensive analysis of the factors influencing foreign student enrollment [1]. To address missing data for certain variables, such as the number of patents and academic staff with scientific degrees, imputation techniques were applied to ensure the completeness and consistency of the dataset [2]. This approach allowed for the inclusion of all relevant variables in the analysis without compromising the integrity of the results.

The study employs an econometric approach to analyze the panel data. The primary analytical tool is the Ordinary Least Squares (OLS) regression model, which is used to estimate the relationship between the dependent variable (number of foreign students) and the independent variables (e.g., student-teacher ratio, scientific capacity, contract fees) [3]. The OLS model is chosen for its simplicity and effectiveness in identifying linear relationships between variables.

3 Results

Findings of the study, which aimed to analyze the factors influencing the demand for higher medical education services at the Bukhara State Medical Institute and Samarkand State Medical University, with a particular focus on the enrollment of foreign students. The results are derived from a comprehensive analysis of panel data spanning the years 2018 to 2023, utilizing econometric techniques and diagnostic tests to ensure the reliability and validity of the findings.

3.1 Descriptive Statistics

The descriptive statistics of the variables used in the study are summarized in Table 1. The analysis reveals significant variations in the number of foreign students, ranging from 230 in 2018 to 1,465 in 2023, with a mean of 680.33 students. The student-teacher ratio averaged 10.58, indicating a moderate level of resource allocation, while the scientific capacity of the institute showed a mean value of 0.36, reflecting its research output and academic reputation. Contract fees for foreign students averaged 3,631.92, with a standard deviation of 289.42, suggesting relative stability in pricing over the study period.

Table 1 Descriptive statistics of the research

№	Variable	Obs	Mean	Std. Dev.	Min	Max	Suitable

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Y	Number of foreign students	12	918,881	992,727	230	4711	1,080365
X_1	Academic period	12	2020	1,78	2018	2023	
X_2	Teachers	12	583,5355	110,362	831	1491	0,189126
X_3	Total students	12	7844,274	2171,149	10663	21760	0,276781
X_4	Students per teacher	12	12,897	1,7115	10,92	15,3275	0,13270*
X_5	Top1000 academic degrees	10*	2,557	1,6885	1	5,5	0,660344
X_6	Internship in Top1000	12	31,2735	35,6035	2,5	99,5	1,138456
X_7	DSc and professor	12	32,9405	13,238	16	53	0,401876
X_8	Phd and candidate of science	12	143,6665	36,8175	97,5	200	0,256271
X_9	Scientific potential	12	0,3045	0,0305	0,270	0,346	0,10016*
X_{10}	Number of defenses (PhD, DSc)	12	51,405	32,57	15	95	0,633596
X_{11}	International journals	12	1554	583,6905	987	2565	0,375605
X_{12}	Scopus database	12	22,595	18,3685	2	53	0,812945
X_{13}	Number of reviews	12	9860,536	11328	852	31750	1,148822
X_{14}	Number of patents	8**	158,518	46,948	107	224	0,296168
X_{15}	Program electronic database	12	191,131	89,356	85,5	341,5	0,467512
X_{16}	Grants	12	30,427	23,4365	14,37	131,62	0,770253
X_{17}	Orders from scientific research	12	384,337	259,7675	201,5	1559,88	0,675885
X_{18}	Hirsh index	12	79,9285	37,4685	21,5	121	0,468775
X_{19}	Foreign faculties	12	47,4165	43,6715	10,5	132,5	0,921019
X_{20}	Student exchange	12	67,405	47,514	6,5	139,5	0,704903
X_{21}	International seminar attendance	12	184,2145	101,9425	99,5	364	0,55339
X_{22}	International seminar teaching	12	93,6785	25,516	64,5	135	0,272378
X_{23}	Foreign language subjects	12	35,381	21,93	5,5	61	0,619824
X_{24}	Winners International competitions	12	14,643	6,9455	4,5	22,5	0,474322
X_{25}	Winners republican competitions	12	24,0715	14,153	26	100	0,587957
X_{26}	Instrument and equipment technician	4***	681,7855	439,18	641,1	2229,00	0,644162

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X_{27}	Library fund	12	2398	771,5	3183	7165,00	0,321726
X_{28}	Foreign student contract fee	12	3869,048	143,7275	3650	4000	0,03714*
X_{29}	Dormitory capacity	12	917,0235	365,234	1350	3040	0,398282

Source compiled by the author

3.2 Correlation Analysis

The Pearson correlation matrix (Table 2) highlights the relationships between the dependent variable (number of foreign students) and the independent variables. A strong negative correlation (-0.96) was observed between the number of foreign students and the student-teacher ratio, indicating that higher student-teacher ratios are associated with lower foreign student enrollment. Conversely, a strong positive correlation (0.99) was found between scientific capacity and foreign student enrollment, suggesting that institutions with higher research output and academic reputation attract more international students. Contract fees showed a moderate negative correlation (-0.96) with foreign student enrollment, implying that higher fees may deter potential applicants.

Table 2 Pearson pairwise correlation matrix of factors influencing the number of foreign students

Variables	(1)	(2)	(3)	(4)
(1) Number of foreign students	1.000			
(2) Students per teacher	-0.96**	1.000		
	(0.0000)			
(3) Scientific potential	0.99***	-0.97**	1.000	
	(0.0000)	(0.0000)		
(4) Foreign student contract fee	-0.96**	0.93*	-0.96**	1.000
	(0.0000)	(0.0000)	(0.0001)	
*** $p<0.01$, ** $p<0.05$, * $p<0.1$				

Source compiled by the author

3.3 Regression Analysis

The Ordinary Least Squares (OLS) regression model was employed to estimate the impact of the independent variables on foreign student enrollment. The results, presented in Table 3, indicate that:

1. Student-Teacher Ratio: A one-unit increase in the student-teacher ratio is associated with a 16.959-unit decrease in the number of foreign students ($p < 0.01$). This finding underscores the importance of maintaining a low student-teacher ratio to attract international students.
2. Scientific Capacity: A one-unit increase in scientific capacity leads to a 4.835-unit increase in foreign student enrollment ($p < 0.01$). This highlights the critical role of research output and academic reputation in attracting international students.
3. Contract Fees: A one-unit increase in contract fees results in a 1.911-unit decrease in foreign student enrollment ($p < 0.05$). This suggests that affordability is a significant factor for international students when choosing an institution.

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The overall model fit, as indicated by an R-squared value of 0.999, demonstrates that the independent variables explain 99.9% of the variation in foreign student enrollment. The F-test statistic of 1780.937 ($p < 0.001$) confirms the statistical significance of the model.

Table 3 Simple linear regression model (OLS) of factors affecting the number of foreign students

Number of foreign students	**Coef.**	**St.Err.**	**t-value**	**p-value**	**95% Conf**	**Interval**	**Sig**
Students per teacher	-16.959	1.463	-11.59	0	-20.334	-13.584	***
Scientific potential	4.835	.898	5.38	.001	2.764	6.906	***
Foreign student contract fee	-1.911	.308	-6.21	0	-2.621	-1.201	***
Constant	73.782	3.916	18.84	0	64.752	82.812	***
Mean dependent var	7.022		SD dependent var	1.241			
R-squared	0.999		Number of obs	12			
F-test	1780.937		Prob > F	0.000			
Akaike crit. (AIC)	-31.865		Bayesian crit. (BIC)	-29.925			
*** $p<.01$, ** $p<.05$, * $p<.1$							

Source compiled by the author

The regression model is specified as follows (1):

$$(Foreign\ Students) = \beta_0 + \beta_1 (Student\text{-}Teacher\ Ratio) + \beta_2 (Scientific\ Capacity) + \beta_3 (Contract\ Fees) + \varepsilon_i \quad (1)$$

where β_0 is the intercept, β_1, β_2, and β_3 are the coefficients of the independent variables, and ε_i represents the error term [4].

3.4 Diagnostic Tests

1. Multicollinearity: The Variance Inflation Factor (VIF) values for the independent variables ranged from 3.27 to 6.10, with a mean VIF of 4.31. These values indicate moderate multicollinearity, which does not significantly affect the reliability of the regression results [5].
2. Normality: The Shapiro-Wilk test yielded a W statistic of 0.85 ($p = 0.03681$), indicating that the residuals are approximately normally distributed. This validates the use of parametric tests in the analysis [6].
3. Heteroskedasticity: The Breusch-Pagan test produced a chi2 statistic of 0.11 ($p = 0.7446$), confirming the absence of heteroskedasticity in the residuals. This ensures the efficiency of the OLS estimates (figure 1) [7].

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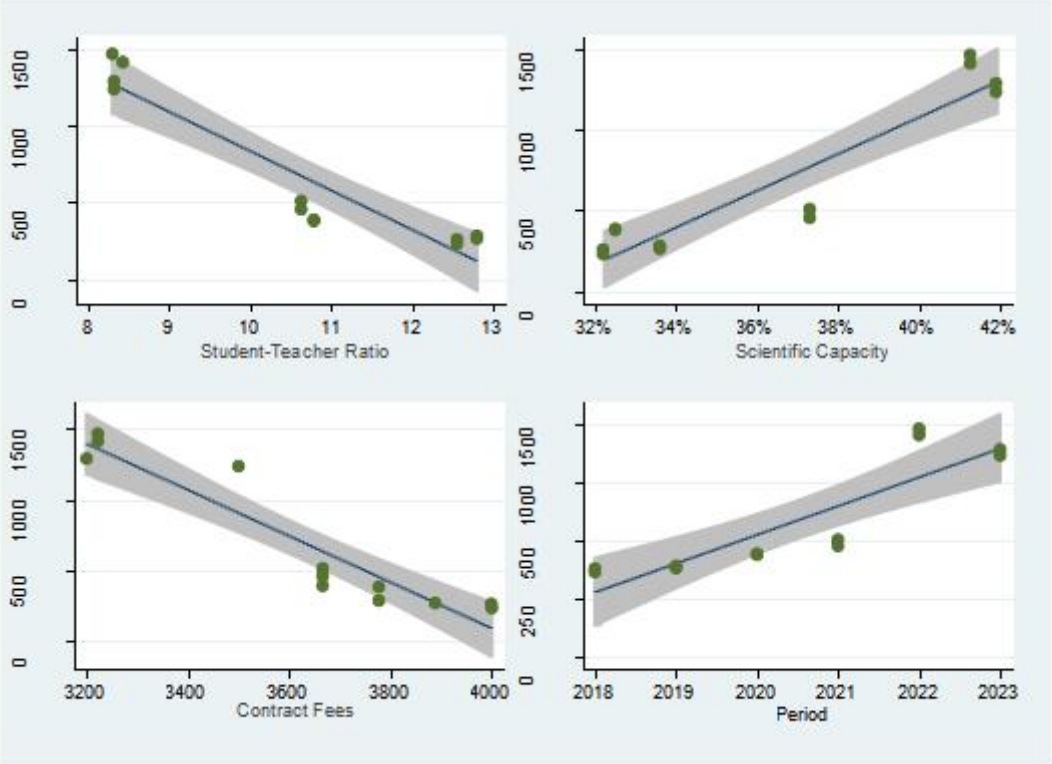

Fig. 1 Normal distribution histogram of factors affecting Y. *Source* compiled by the author

The results of the study reveal several important insights into the factors influencing foreign student enrollment at the Bukhara State Medical Institute and Samarkand State Medical University:

Institutional Capacity: The negative relationship between the student-teacher ratio and foreign student enrollment highlights the need for adequate resource allocation to maintain a favorable learning environment. Scientific Reputation: The positive impact of scientific capacity on enrollment underscores the importance of research output and academic reputation in attracting international students.

Affordability: The negative relationship between contract fees and enrollment suggests that financial considerations play a significant role in students' decision-making processes.

4 Conclusion

This research highlights the critical factors influencing the demand for higher medical education services at the Bukhara State Medical Institute and Samarkand State Medical University. By identifying the key determinants of foreign student enrollment, the research provides a foundation for developing evidence-based policies and strategies to enhance the quality, accessibility, and global competitiveness of medical education in the region[8]. The findings underscore the importance of institutional capacity, scientific excellence, and affordability in shaping the future of medical education and addressing the global shortage of healthcare professionals.

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