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ECONOMETRIC ANALYSIS OF THE INTERACTION BETWEEN FORMS OF EDUCATION IN UZBEKISTAN

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Abstract. This study conducts an econometric analysis of the interaction between different forms of education in Uzbekistan, including traditional, online, and blended learning. Using panel data and regression models, the research examines how these educational modalities influence each other and contribute to overall educational outcomes. The analysis considers factors such as student performance, accessibility, and economic efficiency. Findings indicate that while traditional education remains dominant, online and blended learning are gaining significance, particularly in urban areas. The results provide valuable insights for policymakers and educators in optimizing the integration of diverse educational formats to enhance learning effectiveness.

Keywords: Education development, exogenous factors, Uzbekistan, policy impact, globalization, digital transformation.

1.Introduction

There was adopted at the beginning of a new stage of reforms in Uzbekistan in February 2017, the "Action Strategy for the Five Priority Areas of Development of the Republic of Uzbekistan in 2017-2021" , one of the priorities is "to continue the course of further improving the system of continuing education, increasing the availability of quality educational services, training highly qualified personnel, in accordance with the modern needs of the labor market”. The development of improving the competitiveness of education in the country on the national and international labor markets was also included in the Concept of Integrated Socio-Economic Development of the Republic of Uzbekistan until 2030. [1]

This paper explores the interaction between different forms of education in Uzbekistan—traditional, online, and blended learning—through an econometric approach. Using panel data analysis and regression modeling, the study examines the impact of these educational modalities on student performance, accessibility, and economic efficiency. The findings

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suggest that while traditional education remains dominant, online and blended learning are increasingly complementing it, particularly in urban regions. These trends align with global shifts in education, where digital learning platforms, artificial intelligence, and adaptive learning technologies are reshaping the educational landscape. The study provides empirical evidence on the synergies and trade-offs between these forms of education, offering valuable insights for policymakers and educators to optimize Uzbekistan's educational system in line with international developments.

2.Literature review

Theoretical aspects of brand and brand equity management, as well as modern trends, are studied by such foreign scientists as A. Aaker [2], K. Keller [3], T. Gad [4], S. George [5], A. Ronald, M. Waqas [6], A. Brzaković.

Issues of creating brand equity in the education system of the Commonwealth of Independent States are studied in the scientific research of such scientists as N.V. Khmelkova [7], T.Yu. Mitrofanova [8], V.V. Vanyushkina [9], V.B. Simonov.

Theoretical and methodological aspects and organizational issues of the brand in the higher education system of Uzbekistan are considered by such scientists as B.R. Adizov [10], A. Askarov [11], G.N. Akhunova [12], B.A. Begalov [13], A.Sh. Bekmurodov [14], K. Gazie [15], S.S. Gulyamov, Sh.N. Zainutdinov [16], M.A. Ikramov [17], N.K. Yuldashev, D.Kh. Nabiev [18], S.T. Norkulov [19], D.N. Rakhimova [20], R.A. Rakhmanbaeva [21], M.Kh. Saidov [22], N. Sodikov, M. Khakimova, Sh.D. Ergashkhodjaeva, K.K. Kurolov, K.Shaturaev.

3.Analysis and results

In this research paper, an econometric analysis of the interaction between the forms of education was conducted and similarities or common features were identified. For HEIs, real models of the advantages of brand equity development, if any, were developed.

When choosing the competitive brand equity, the following questionnaire variables were selected: university fame, level of knowledge, quality of the IRC, new literature, modern audience, international relations, age, gender and profession.

During the study, the following scientific hypotheses were formulated using STATA 17.00 and SPSS 25.0 programs:

H0: There are no similarities between public, private and joint educational programs.

H1: There are similarities between public, private and joint educational programs.

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The following table shows the distribution of the frequency of choice between various alternative higher education institutions by professions (Professions) of individuals. Researchers, students, staff and teachers were selected for the professional categories. The total number of selected individuals is 487 people.

In Table 10, staff and researchers at private HEIs rated the university's reputation on a scale of 1 to 3. Staff and researchers at public HEIs also rated the university's reputation on a scale of 1 to 3. Below, we test hypothesis H0.

Multinomial logistic regression analyzes the relationship between occupation, age, gender, and individuals when choosing an alternative. The table presents coefficients, standard errors, z-scores, and p-values for each alternative category variable.

The main result is «State HEUs», the odds for other alternatives are compared to this category. The results show that there is a significant influence on the choice of alternative between profession and young people. For example, persons belonging to the category of «profession»are more likely to choose an alternative to HEU2 or HEU3 in relation to the category «State». Similarly, those aged 26-35 are less likely to choose an alternative HEU1 option compared to the HEU1 category «State».

Table 1

Analysis of the latent model of brand equity of the higher education institution in Uzbekistan

WHOA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Mr
State	**(base outcome)**						
Private							
modern_audience	1.047	.34	3.08	.002	.38	1.714	** *
Profession	2.115	.289	7.31	0	1.548	2.682	** *
Constant	-35.018	5.949	-5.89	0	-46.678	-23.357	** *
Quality_IRC	-1.487	.483	-3.08	.002	-2.435	-.54	** *
New_Literature	1.388	.494	2.81	.005	.42	2.356	**

*

Mean dependent var	1.216	SD dependent var	0.468
Pseudo r-squared	0.290	Number of obs	487
Chi-square	158.622	Prob > chi2	0.000
Akaike crit. (AIC)	439.844	Bayesian crit. (BIC)	548.739

*** p<.01, ** p<.05, * p<.1

Gender also has a significant impact on alternative choices, but the results do not correspond to the profession and age. For example, women are more likely than men to choose an alternative to HEU1, and men are more likely to choose an alternative SOPSthan women.

$$\Pr = (\text{State} = \text{Private}) = \frac{e^{-35.018+0.61+0.047-0.997+0.115}}{1+e^{-35.018+0.61+0.047-0.997+0.115}+e^{-21.067-0.487+0.388+0.309}}$$

(equation 13)

For example, the probable logarithm of brand equity based on an increase in the quality of the RPI by 1 level is higher in private HEU than in public HEU by 0.61. If the state of the modern audience in private HEUs improves by 1 level, the likely logarithm of brand equity development will be 1.047 higher than in public HEUs. The probable logarithm of brand equity at the age of 26-35 in private HEUs is lower than in public HEUs by 0.997. If professional activity in private HEUs improves by 1 level, the likely logarithm of brand equity is 2.115 higher than in public ones.

If in SOPS the modern audience will improve by 1 level, the probable logarithm of brand equity development will be 1,487 lower than in the HEU brand. When improving the new literature in the SOPS Level 1 is the probable logarithm of brand equity development higher by 1.388 compared to government HEUs. With the improvement of professional activity in SOPS 1 level is the probable logarithm of brand equity development higher by 1.309 compared to state HEU

As a result of improving the quality of education in higher education institutions, mutual comparisons in the formation of brand equity become statistically significant. In this regard, we rejected the hypothesis H0 and chose an alternate form. According to the calculations obtained, RPCs have less brand equity than SOPS state universities. The level of provision of new literature is also better organized in SOPS.

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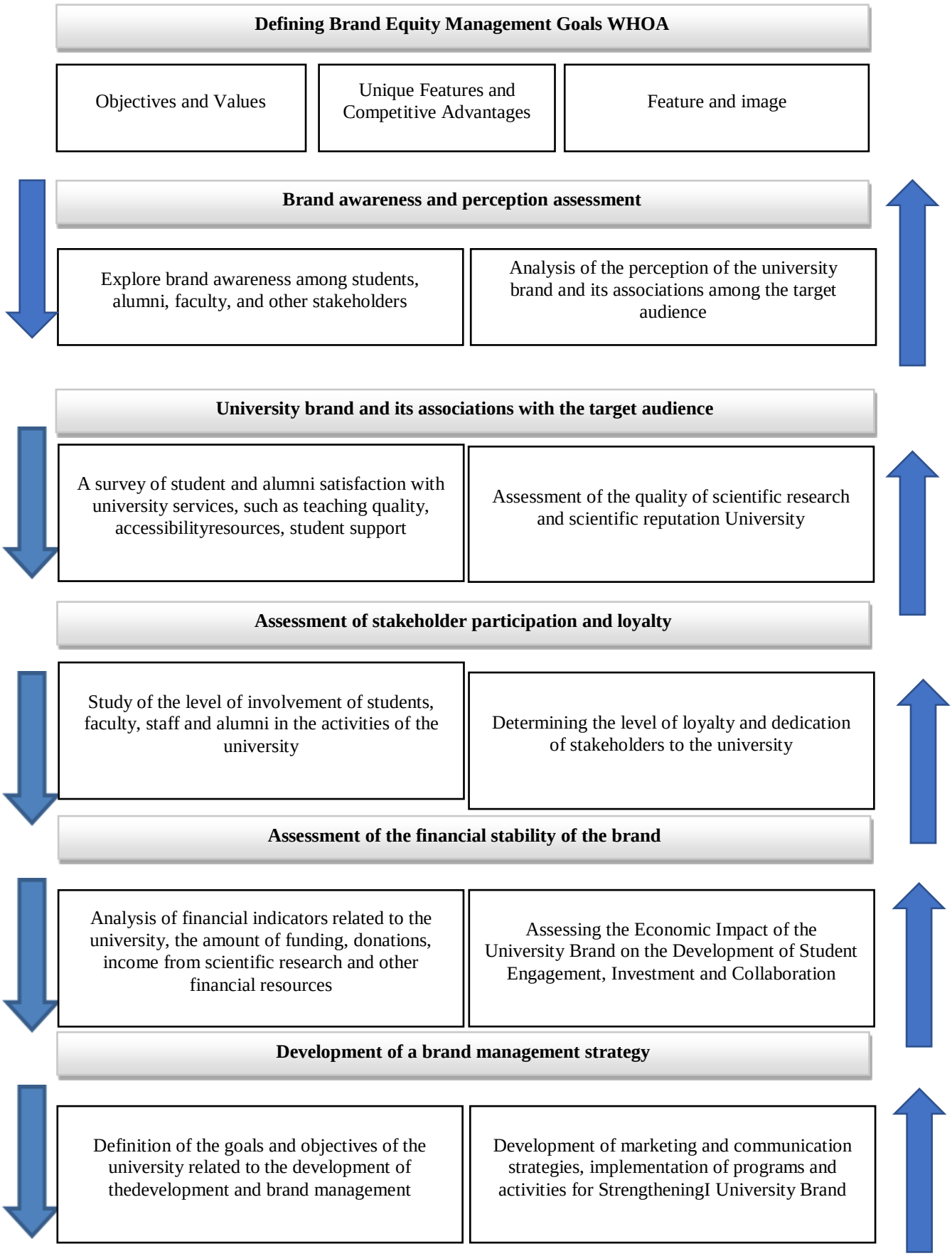

Fig.1. University Brand Capital Development Management Mechanism

Variables such as university fame, level of knowledge, current audience, international relations, and gender are considered statistically insignificant in the benchmarking process. This means that the issues of brand equity development remain problematic in the republican HEUs, where these variables are selected.

Improving the marketing strategy of brand equity management in higher education institutions is an ongoing process that requires constant analysis, study and adaptation. The main purpose of creating advanced brand equity is to distinguish the university from the consumer choices, attract talented students and prepare them for future success. As a result, an effective brand equity management marketing strategy is a key success factor for higher education institutions. This helps the university achieve its goals, attract and retain talented students, and strengthen its reputation in the field of education. Most importantly, the university should have clear goals for managing brand equity.

The figure below (Figure 5) shows brand equity management at a university, and studying and evaluating different aspects of a brand can help in developing a brand management strategy. At each stage, appropriate research should be carried out to strengthen and develop the university's brand.

In the questionnaire presented in the thesis, the Ordered logistic model Ologit with qualitative indicators is used (Table 11). This allows us to build a regression equation for individual values of the university brand, evaluated by respondents at 5 levels, and to assess the interaction of variables with the dependent variable. According to the regression results, the relative logarithmic coefficient of the expected probability of a university's fame increases by 1.05 with an increase in educational attainment by one unit (i.e., from 1 to 2).

The results of the simulation can be explained as follows:

- as a result of an increase in the level of knowledge by one (i.e. from 1 to 2), the probable logarithmic coefficient of the expected popularity of the university p1.537 (Table 2):

$$S_j = B\ x_j \quad \text{in the}_j \quad \text{(equation 14)}$$

Table 2

Regression model Ologies Seeродолжительностand of the University Life Cycle[1]

[1] Author's development

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fame_University	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Mr
scientific_prestige	1.809	.229	7.90	0	1.36	2.258	***
proposal_work: base 1							
Sports_Site	.617	.195	3.17	.002	.235	.998	***
Practical_cooperation: base 1							
2	-3.835	1.129	-3.40	.001	-6.048	-1.622	***
3	-2.972	1.084	-2.74	.006	-5.095	-.848	***
5	-3.562	1.197	-2.98	.003	-5.907	-1.216	***
University_Advertising	.615	.21	2.93	.003	.204	1.027	***
University Evaluation: base 1	0	.	.	.	.	.	
2	-3.906	1.279	-3.05	.002	-6.413	-1.4	***
Profession							
Student	3.313	.85	3.90	0	1.647	4.98	***

Mean dependent var	4.503	SD dependent var	0.877
Pseudo r-squared	0.534	Number of obs	487
Chi-square	488.714	Prob > chi2	0.000
Akaike crit. (AIC)	530.349	Bayesian crit. (BIC)	748.139

*** p<.01, ** p<.05, * p<.1

When this new value found was calculated based on equation 14, the following probabilities were determined:

P(fame_University=«1») = P(S u ≤ _cut1) = P(S u ≤ 7.014);

P(fame_University =«2») = P(S u ≤ _cut2) = P(7.014<S u ≤ 8.8);

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P(fame_University =«3») = P(S u ≤ _cut3) = P(8.8<S u ≤ 11.344);

P(fame_University =«4») = P(S u ≤ _cut4) = P(11.344<S u ≤ 14.65).

For example, those who rate employability as 4 have probable The logarithmic coefficient of expected fame of the university is 0.07 higher than those who rate it as 1.

If we look at the length of a university's life cycle by profession, the relative logarithmic coefficient of expected fame of a university is 10,399 higher than that of research students. This means that university students interpret brand equity with higher values than researchers. The opinions of the remaining respondents were considered insignificant (Table 12). Gender also has a significant influence on the choice of alternatives, but the results do not correspond to the profession and age. For example, women are more likely to choose an alternative ASU1 compared to men, and men are more likely to choose an alternative ASU1 SOPS compared to women. For example, brand equity based on raising the quality level of the RPI by 1 level in private HEUs is more likely to have a logarithm of 0.61 than in public HEUs. An improvement in the state of the modern audience in private HEU by 1 level has a higher probability of developing brand equity than in public ones, the logarithm of which is 1.047. The probable logarithm of brand equity in private HEUs aged 26-35 is 0.997 lower than in public HEUs aged 16-25. An increase in professional activity by 1 level in private HEUs has a higher logarithm of the probability of developing brand equity than in public ones, equal to 2115.

Table 3

Ologit Regression Model of University Life Cycle Duration

fame_University	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Mr
Professional_skill_Graduates	2.098	.329	4.73	0	1.544	2.852	***
Quality of the IRC:	1	.	.	.	.	.	
New_Literature	1.549	.262	2.59	.01	1.112	2.158	***
Modern_auditorium	1.514	.264	2.38	.017	1.076	2.129	**
International_relations	1	.	.	.	.	.	
5	14.992	18.284	2.22	.026	1.373	163.672	**
Practical_cooperation	1	.	.	.	.	.	

	2	.207	.198	-1.65	.099	.032	1.346	*
HEU: State		1	.	.	.	.	.	
	quotient	.504	.196	-1.76	.078	.235	1.08	*
	SOPS	.275	.158	-2.24	.025	.089	.851	**
Age 16-25		1	.	.	.	.	.	
	46-60	3.759	2.753	1.81	.071	.895	15.792	*
Floor		1	.	.	.	.	.	
	Husband.	1.619	.42	1.86	.063	.973	2.693	*
Profession		1	.	.	.	.	.	
	Student	10.399	6.668	3.65	0	2.96	36.541	***

Mean dependent var	4.503	SD dependent var	0.877
Pseudo r-squared	0.337	Number of obs	487
Chi-square	308.543	Prob > chi2	0.000
Akaike crit. (AIC)	664.520	Bayesian crit. (BIC)	785.979

*** p<.01, ** p<.05, * p<.1

When upgrading the modern audience by 1 level in SOPS The probabilistic logarithm of brand equity development is 1.487 lower than that of the HEU brand. When improving the new literature in the SOPS Level 1 is the probable logarithm of brand equity development higher by 1.388 compared to government HEUs. With the improvement of professional activity in SOPS by 1 level, the probable logarithm of the development of brand equity is 1.309 higher compared to state HEU. The coefficients represent the change in the logarithmic coefficients of this alternative for a single growth of the explanatory variable. Likewise, age also influences the choice of alternative. Those aged 26-35 years are less likely to choose an alternative HEU1 compared to the HEU1 category «state». This may be because younger people are more attracted to innovative and experiential alternatives, while older adults prefer more established and traditional options.

It is necessary to develop targeted marketing and communication competencies to create a strong brand identity and awareness of the strengths and achievements of the educational institution. It remains important to use a variety of channels, including digital platforms, social media, events, and alumni networks, to build relationships with prospective students, parents, employers, and other stakeholders. Collaboration with a variety of stakeholders, including

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faculty, staff, students, alumni, employers, and the local community, is a priority to take new ideas and decision-making processes to the next level.

According to the overall findings, the methodology for creating brand equity in HEU has been improved through research. At the same time, balanced systematic approaches to the creation, development and management of brand capital were developed. In particular, criteria for assessing and monitoring brand capital in the field of higher education and scientific and practical recommendations for their practical application were proposed. In general, this thesis is a source of significant scientific and practical value for the field of higher education. Its results can be widely used in the creation and management of brand equity in higher education institutions.

4.Conclusions

As a result of the study conducted using the methodology of brand equity 9. During the study, the effects of brand equity development were studied based on a social online questionnaire consisting of 33 questions from existing higher education institutions in our country. In the process of econometric analysis using the Stata 17.0 program, a structural model (Principal component analysis) was used. The results obtained in the formation of brand equity in higher education institutions of Uzbekistan were explained by explaining the 5 qualities mentioned in the questions of the University Brand questionnaire.

10. As a result of an increase in the student brand by one unit, the university brand increases by 1.546 units. As a result of an increase in the teacher brand by one unit, the university brand increases by 1.415 units. As a result of an increase in the practical brand by one unit, the university brand increases by 1.416 units. The teacher brand coefficient is 0.553, which indicates a strong positive relationship with the practical brand. This means that as the teaching brand grows, the performance brand also grows.

11. As a result of the econometric analysis of the interaction of the forms of education in the dissertation, similarities or common features were identified. If any, then a multinomial logistic regression model of real advantages in the development of brand equity was developed for the HEI. When choosing competitive brand equity, variables such as university reputation, level of knowledge, quality of the IRC, new literature, modern audience, international relations, age, gender and profession were obtained based on surveys of 487 people. According to the econometric analysis, gender also has a significant impact on the alternative choice, but the results are not consistent with profession and age.

12. Information on Instagram, Facebook, Twitter forums, blogs, sites related to their brand and educational programs, as well as the use of artificial intelligence (AI) will help improve the marketing strategy for managing brand equity in higher education institutions and analyze the perception of university brands in Uzbekistan. 13. When improving the methodology for creating brand capital in the higher education system, it is first necessary to develop targeted marketing and communication competencies to increase awareness of the strengths and achievements of the educational institution. Digital platforms, social media and various events are important tools for building relationships with applicants, students, parents, employers and other stakeholders.

14. When improving the methodology for creating brand capital in the higher education system, it is first necessary to develop targeted marketing and communication competencies to increase awareness of the strengths and achievements of the educational institution. Digital platforms, social media and various events are important tools for building relationships with applicants, students, parents, employers and other stakeholders.

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