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Article

Econometrical Evaluation of the Entrepreneurial Activity of Private Educational Institutions of Namangan Region

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Abstract: This paper econometrically assesses the entrepreneurial efficiency of private educational institutions in Namangan region of Uzbekistan based on quarterly data from LSL (Learning Skills Lab) center in 2017–2024 (32 observations). Several log-linear regressions were estimated in Stata, employing a step by step procedure—correlation criteria, lag term tests, log transformation, VIF test and elimination of insignificant regressors. Dependent variable: profit; independent regressors: students flow, number of courses, branches, monthly fee per student, professors' qualification, advertising cost, infra-structure cost, incurrent investments. The conclusions of the study deny the perfect managerial strategy and encourage a flexible institution-focused strategy—development of retailed admission levels and consumer oriented prices, optimal service levels, appraisal of branches.

Keywords: Private education, learning centers, entrepreneurial activity, econometric modelling, multiple regression, profit determinants, non-state educational institutions, VIF analysis, log-linear model,educational entrepreneurship.

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1. Introduction

The private education sector has also constitute a vibrant segment of the non-state economy of Uzbekistan. In Namangan region private learning centers are a significant, vibrant component of the non-state educational services market, characterized by their agility and ability to respond quickly to different learners' demand for relevant, practically-oriented knowledge and skills, their flexibility and extension of service provision to diverse clients, age groups and specialization areas. A limited number of studies have attempted to measure the entrepreneurial performance of private learning centers in quantitative terms, due to lack of supporting data. The factors which are exploitable for generating profitable output in private learning centers need to be identified for policy designing, institutional management and educational planning [1].

A regional social survey across districts of Namangan charted a significant high level of public confidence in private learning centers. When asked about the most relevant knowledge and skills provided for by educational institutions, most respondents answered by learning centers, with Namangan district having the highest share of 82% and Kosonsoy and Chust districts the lowest at 65%. Overall 75% of respondents in the region trusted learning centers in comparison to 16% in schools and 9% in high education institutions. This study intends to build an econometric model of private institutional entrepreneurial activity and evaluate it for Namangan region, covering an individual, established learning center, namely Learning Skills Lab [2].

2. Methods

2.1. Data

Financial and operational data for the period 2017—2024 were gathered from a namangan region private learning center LSL. 32 observations per each data set were available. Data were obtained from the institutions and prepared for modelling by the writer [3].

The dependent variable in all models is profit (y), measured in Uzbek soums [4]. The following independent variables were examined:

x_1 — number of students (persons)

x_2 — infrastructure improvement expenditures (soums)

x_3 — advertising expenditures (soums)

x_4 — number of courses offered (units)

x_5 — average teacher qualification level (IELTS score)

x_6 — average monthly tuition fee (soums)

x_7 — number of branches (units)

x_8 — attracted investments (soums)

2.2. Analytical Approach

All econometric modelling and statistical testing were undertaken using the Stata package [5]. A five-step sequential approach was taken:

Step 1— Correlation screening: Pearson linear correlation coefficients between all independent variables and profit were compiled in order to select candidate regressors for further testing;

Step 2— Lag testing: 1-, 2-, and 3- quarter-lags of advertising gross advertising expenditures (x 3) were created and tested for correlation with profit, since advertising effects are believed to be lagged;

Step 3— Log transformation: Several monetary terms with large magnitude were logged to reduce the impact of outliers and enable elasticities to be estimated [6];

Step 4— Multicollinearity testing: Variance inflation factors (VIF) were calculated [7];

Step 5— Stepwise model narrowing: Any regressors having p-values above 0.05 were systematically excluded.

The general form of the multiple log-linear regression model is [8], [9], [10]:

$$Ln(y) = \beta 0 + \beta 1 \cdot Ln(x_i) + ... + \beta k \cdot xk + \varepsilon$$

3. Results

3.1. Learning Skills Lab (LSL)

The initial correlation analysis revealed that, among the assessed inputs, x_1 (students), x_4 (courses), x6 (monthly fee), and x7 (branches) were strongly positively correlated to profit (Pearson coefficients 0.98, 0.80, 0.79, and 0.67 respectively); while x2 (infrastructure), and x8 (investments) were less correlated values and thus omitted from the initial model (Figure2.11.).

```
. correlate
(obs=32)
```

	y	x1	x2	x3	x4	x5	x6	x7	x8
y	1.0000								
x1	0.9823	1.0000							
x2	-0.1554	-0.2063	1.0000						
x3	0.3383	0.2611	0.6637	1.0000					
x4	0.7996	0.7546	0.3110	0.7841	1.0000				
x5	0.4583	0.4932	0.1449	0.4426	0.5440	1.0000			
x6	0.7884	0.7363	0.2992	0.8054	0.9255	0.6751	1.0000		
x7	0.6689	0.6885	0.2400	0.6073	0.7372	0.7259	0.8347	1.0000	
x8	0.1746	0.2017	-0.2333	-0.0706	0.0778	-0.0436	0.0495	0.0950	1.0000

Figure2.11. Correlation levels and interrelationships of independent variables on LSL profit.

Lag analysis on advertising costs (x 3): It was identified that the second quarter lag (lag2_x 3) correlated most strongly with profit (r=0.8551). This had been added to the first model. However, it was found not to be statistically significant after regression ($p > 0.05$) so it was removed (Figure 2.12).

```
. reg y x1 Lag2_x3 x4 x5 x6 x7
```

Source	SS	df	MS	Number of obs	=	30
				F(6, 23)	=	315.33
Model	7.0858e+16	6	1.1810e+16	Prob > F	=	0.0000
Residual	8.6139e+14	23	3.7452e+13	R-squared	=	0.9880
				Adj R-squared	=	0.9849
Total	7.1719e+16	29	2.4731e+15	Root MSE	=	6.1e+06

y	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
x1	469730.3	23134.63	20.30	0.000	421872.7	517587.9
Lag2_x3	.609492	.9035381	0.67	0.507	-1.259619	2.478603
x4	-1069187	1099916	-0.97	0.341	-3344537	1206163
x5	-1.06e+07	3909660	-2.71	0.013	-1.87e+07	-2493732
x6	280.7918	72.34453	3.88	0.001	131.1357	430.4478
x7	-9665643	3552184	-2.72	0.012	-1.70e+07	-2317391
_cons	3.68e+07	2.20e+07	1.68	0.107	-8602148	8.23e+07

Figure 2.12. Initial regression results for LSL.

In this model after large scale variables are taken log-log transformed and insignificant regressors are sequentially removed (x 5 was dropped, $p>0.05$), the final model for LSL is (Figure 2.13, Figure 2.14.) [11]:

```
. cor Ln_y Ln_x1 x4 x5 Ln_x6 x7
(obs=32)
```

	Ln_y	Ln_x1	x4	x5	Ln_x6	x7
Ln_y	1.0000					
Ln_x1	0.9886	1.0000				
x4	0.8149	0.7731	1.0000			
x5	0.6107	0.5938	0.5440	1.0000		
Ln_x6	0.8054	0.7494	0.8975	0.7477	1.0000	
x7	0.8560	0.8111	0.7372	0.7259	0.8821	1.0000

Figure2.13. Correlation analysis (after log transformation).

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
       Ln_x6 |     19.20    0.052083
          x4 |     10.17    0.098316
          x7 |      8.09    0.123677
       Ln_x1 |      4.59    0.217795
          x5 |      3.02    0.330748
-------------+----------------------
    Mean VIF |      9.01
```

Figure2.14. VIF analysis results.

$$Ln(y) = 12{,}28 + 0{,}94\, ln(x_1) + 0.04\ x_4 + 0.23\, x_7 + \varepsilon$$

```
. reg Ln_y Ln_x1 x4 x7

      Source |       SS           df       MS      Number of obs   =        32
-------------+----------------------------------   F(3, 28)        =    834.61
       Model |  51.1212165         3  17.0404055   Prob > F        =    0.0000
    Residual |  .571684151        28  .020417291   R-squared       =    0.9889
-------------+----------------------------------   Adj R-squared   =    0.9878
       Total |  51.6929006        31  1.66751292   Root MSE        =    .14289

------------------------------------------------------------------------------
        Ln_y | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
       Ln_x1 |   .9419805   .0438672    21.47   0.000     .8521226    1.031838
          x4 |   .0398267   .0144507     2.76   0.010     .0102258    .0694276
          x7 |   .2360889   .0649754     3.63   0.001     .1029927    .369185
       _cons |   12.28081   .1047169   117.28   0.000     12.06631    12.49532
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
       Ln_x1 |      3.64    0.274963
          x7 |      3.21    0.312010
          x4 |      2.73    0.366922
-------------+----------------------
    Mean VIF |      3.19
```

Figure2.15. Final regression model analysis for LSL.

The model is well-fitted: R 2 = 0.9889, Adjusted R 2 = 0.9878. The F-test is significant: Prob > F = 0.0000, and the Root MSE is very low (around a 1000). All the Variance Inflation Factors (VIF) are in the acceptable range and all the two-tailed p-values are below 0.05.

Interpretation: If the number of student enrolments increased by 1% then profit would increase by 0.94%. If the number of courses increases by 1 then profit increases by about 4%. If there are more branches profit increases by about 23%.

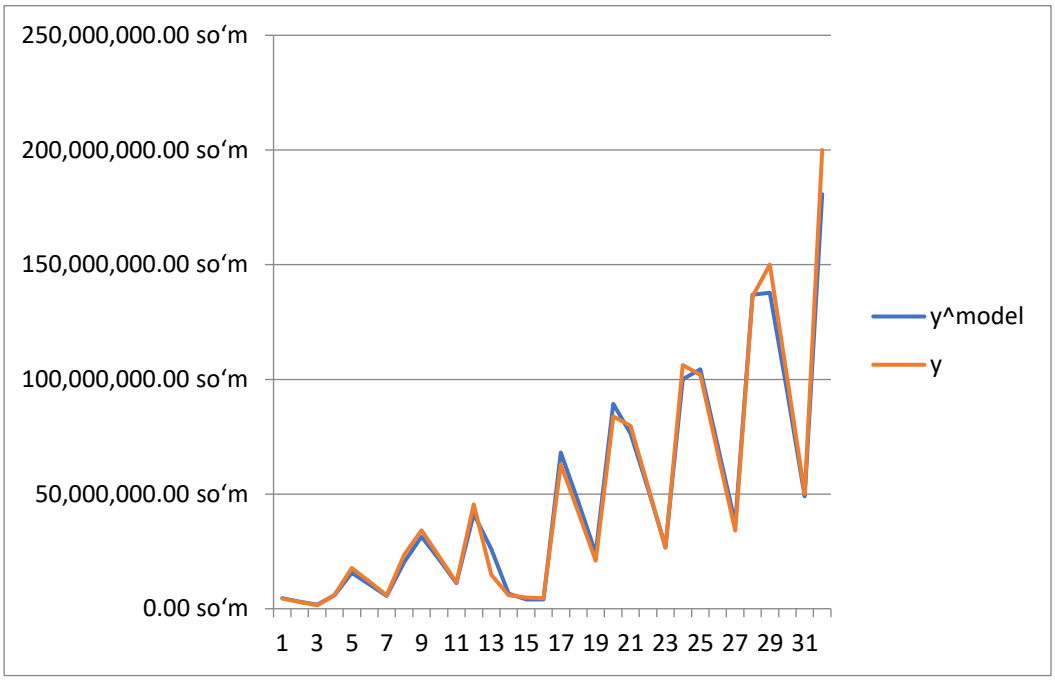

Figure 2.16 — Actual vs fitted values for LSL.

4. Discussion

The results of the private learning center analysis in the Namangan region, as the case study, in terms of profit formation show many consistent, but also region- or institution-specific trends [12].

We find from all three institutions the most significant and stable determinant of profit (x 1)—the student numbers [enrolment], with close to unit elasticities (0.94, for LSL). So the commercially successful private institutions are driven mainly by a demand-effecting variable: bulk demand, proved textbook of the service-sector theory of profits with customer base size being the revenue corelation [13].

On the other hand, the effect of other factors varies considerably among Institutions, indicating that management practices must be adapted to local circumstances:

Branch expansion (x7) has a positive impact at LSL (+23% per additional branch). The course portfolio breadth (x 4), then has a positive effect on profit at LSL (+4%), emphasizing diversification benefits of the widened service offering bringing in more learners [14].

The lack of fee-related effects in LSL (these were dropped either because of multicollinearity or insignificance) requires further investigation.

Taken together, these findings rule out one standard pathway in the management of private education institutions. They seem to suggest, rather, that management has to be tailored in accordance with the institutions' most relevant market segment, cost profile, and managerial process; and they seem to hint at four directions in which entrepreneurial performance could be bolstered in the private education market: (i) intensification of marketing efforts, to foster student entries; (ii) improvements in the adjustment of service mix; (iii) achievement of more comprehensive economic assessment of branch profitability; (iv) adoption of demand-oriented pricing models [15].

One limitation of this study is the small sample size, with data obtained from three institutions in a single region. If conducted with a larger sample of institutions across several regions, the results would be more accurately generalisable, and other factors, (e.g., use of digital instruction, teachers leaving their positions and macroeconomic indicators), could be examined.

5. Conclusion

In the 2017–2024 period, the cross-sectional, cross-temporal multiple log-linear regression models are built on data collected from Namangan regional private learning centers operating three, two and one years respectively. The models indicate that the three private learning centers revenue performance is strongly driven by student inflows. The effect of the nature of other key variables (number of courses offered, Number of franchises, tuition fees) does differ by the nature of the business model.

The econometric models developed for LSL ($R^2 = 0.9889$) are statistically very significant, with a high predictive power, establishing a strong quantitative base for private educational entrepreneurial planning.

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