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ECONOMETRIC MODELLING OF FAMILY ENTREPRENEURSHIP DEVELOPMENT IN THE TOURISM SECTOR: EVIDENCE FROM UZBEKISTAN

Pardayeva Ozoda Mamayunusovna
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Abstract. This paper develops a quantitative framework for explaining and forecasting the growth of family-run enterprises operating in Uzbekistan's tourism sector. Drawing on official statistical data covering the period 2011–2025, nine potential socio-economic determinants were screened through pairwise correlation analysis, after which a parsimonious log-linear regression model was estimated using the ordinary least squares method. The results indicate that investment directed to the tourism sector is the leading factor influencing the development of family businesses: a one per cent increase in sectoral investment is associated with an approximately 0.39 per cent increase in the number of family enterprises. The model explains about 94 per cent of the observed variation. Based on the estimated elasticity, the scenario forecast suggests that the number of family tourism enterprises may reach approximately 34.8 thousand units by 2030. The findings provide an empirical basis for improving credit, infrastructure, and training programmes aimed at supporting family entrepreneurs in tourism.

Keywords: family entrepreneurship; tourism economy; econometric modelling; correlation–regression analysis; investment elasticity; forecasting; Uzbekistan.

Аннотация. В статье разработана количественная основа для объяснения и прогнозирования роста семейных предприятий, действующих в сфере туризма Узбекистана. На основе официальных статистических данных за 2011–2025 годы девять потенциальных социально-экономических факторов были отобраны с помощью парного корреляционного анализа, после чего методом наименьших квадратов была оценена компактная логарифмическая регрессионная модель. Результаты показывают, что инвестиции, направляемые в сферу туризма, являются ключевым фактором развития семейного бизнеса: рост отраслевых инвестиций на один процент сопровождается увеличением числа семейных предприятий примерно на 0,39 процента. При этом модель объясняет около 94 процентов наблюдаемой вариации. Сценарный прогноз показывает, что к 2030 году количество семейных туристических предприятий может достигнуть около 34,8 тысячи единиц. Полученные результаты формируют эмпирическую основу для совершенствования программ кредитной поддержки, развития инфраструктуры и подготовки кадров для семейного предпринимательства в сфере туризма.

Ключевые слова: семейное предпринимательство; экономика туризма; эконометрическое моделирование; корреляционно-регрессионный анализ; инвестиционная эластичность; прогнозирование; Узбекистан.

INTRODUCTION

In economies undergoing structural transformation, the service sector, particularly tourism, plays an important role in expanding employment opportunities. Tourism is widely recognised for its broad coverage, relatively modest demand for material resources, short payback periods, and, above all, its capacity to generate jobs. Industry estimates suggest that every thirty incoming visitors directly support approximately one job in tourism and an additional two jobs in related industries [1]. For Uzbekistan, where more than half a million young people enter the labour force annually, while newly created jobs amount to approximately 350–400 thousand, the effective use of this employment multiplier is of particular importance.

Within the tourism economy, family-run businesses occupy a distinctive niche. They mobilise household resources, including dwellings, land plots, culinary traditions, and craft skills, and transform them into productive economic assets, while distributing entrepreneurial income directly within the family unit. The state programme "Every Family is an Entrepreneur", launched in 2018, together with subsequent policy measures, has positioned family entrepreneurship as an important instrument of employment policy [2]. At the same time, decisions on where and how to channel preferential credit, land, and training can be further strengthened through evidence-

based approaches. In this regard, there is a need for a tested quantitative model linking the growth of family tourism enterprises with measurable economic determinants.

The purpose of this study is to construct and verify an econometric model of growth in the number of family enterprises operating in Uzbekistan's tourism sector, to identify the factors exerting the strongest influence on this growth, and to derive forecast parameters up to 2030. The tasks of the research include assembling a consistent statistical base for 2011–2025, screening candidate factors through correlation analysis, estimating and diagnosing a multifactor regression model, and translating the verified model into scenario forecasts that can be used in sectoral planning.

LITERATURE REVIEW

The international literature treats family business in tourism as an independent field of research. Getz and Carlsen, examining owner-operated firms in rural tourism and hospitality, demonstrated that family ventures pursue a combination of lifestyle and commercial goals, which distinguishes their growth behaviour from that of corporate firms [3]. Their later monograph systematised the life cycle, succession, and location decisions of tourism family firms [4], while Andersson, Carlsen, and Getz compared family business goals across national contexts and found that family circumstances are an important determinant of expansion decisions [5]. Peters and Buhalis highlighted the need to strengthen training and strategic planning in small family hotels [6]. From the perspective of entrepreneurship theory, Drucker defined innovation as the key instrument of the entrepreneur [7], while Cooper and co-authors positioned small enterprises within the broader structure of tourism supply [8].

The methodological basis of the present study relies on the econometric tradition. Magnus, Katyshev, and Peresetsky provide a fundamental treatment of least-squares estimation and specification testing [9]. Siegel offers an applied perspective on regression analysis in business statistics [10], while Gujarati and Porter systematise the diagnostic toolkit, including coefficients of determination and the Fisher and Student criteria, applied in the present study [11]. The Durbin–Watson statistic used for residual diagnostics originates from the classical work of Durbin and Watson [12].

Among Uzbek scholars, Pardayev, Tuxliyev, and Ostonov have analysed the essence and organisational features of family entrepreneurship in services and tourism, emphasising family ownership, management by the head of the family, and the intra-family distribution of profit [13]. Abdullayev and Berkinov have developed correlation–regression techniques for forecasting national economic indicators [14]. However, the existing body of research has not yet provided a verified econometric model that connects the number of family tourism enterprises in Uzbekistan with macro-level determinants over a sufficiently long observation period. This study seeks to address this research gap.

RESEARCH METHODOLOGY

The study employs correlation–regression analysis applied to annual national statistical data for 2011–2025, compiled from the Statistics Agency under the President of the Republic of Uzbekistan and the National Tourism Committee [15]. The dependent variable (Y) is the number of family enterprises operating in the tourism sector, measured in units. Nine potential explanatory factors were selected on theoretical grounds and are presented in Table 1.

Table 1
Candidate factors influencing the growth in the number of family enterprises in the tourism sector[1]

Factor	Notation
Gross domestic product, bln UZS	X1
Total income of the population, bln UZS	X2
Investment in fixed capital, bln UZS	X3
Exports of tourist services, mln USD	X4
Output of small business entities, bln UZS	X5
Innovation expenditure of enterprises, bln UZS	X6
Value of tour packages sold, bln UZS	X7
Retail trade turnover, bln UZS	X8
Investment directed to the tourism sector, bln UZS	X9

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The general analytical form of the model is represented by the multifactor linear regression equation:

$Y = a_0 + a_1X_1 + a_2X_2 + ... + a_nX_n$,

where the parameters are estimated using the least squares method. The quality and statistical significance of the model are assessed according to conventional econometric criteria: the coefficient of determination (R^2), which should be close to one; the Fisher F-statistic, which should exceed its critical value; Student's t-statistics for individual parameters, with p-values below 0.05; and the Durbin–Watson statistic for residual autocorrelation, whose preferred value is close to two [11, 12]. Since the underlying time series show exponential growth, the variables were additionally transformed into natural logarithms. This transformation allows the estimated coefficients to be interpreted directly as elasticities. The overall research algorithm is organised into five hierarchical stages, as shown in Figure 1.

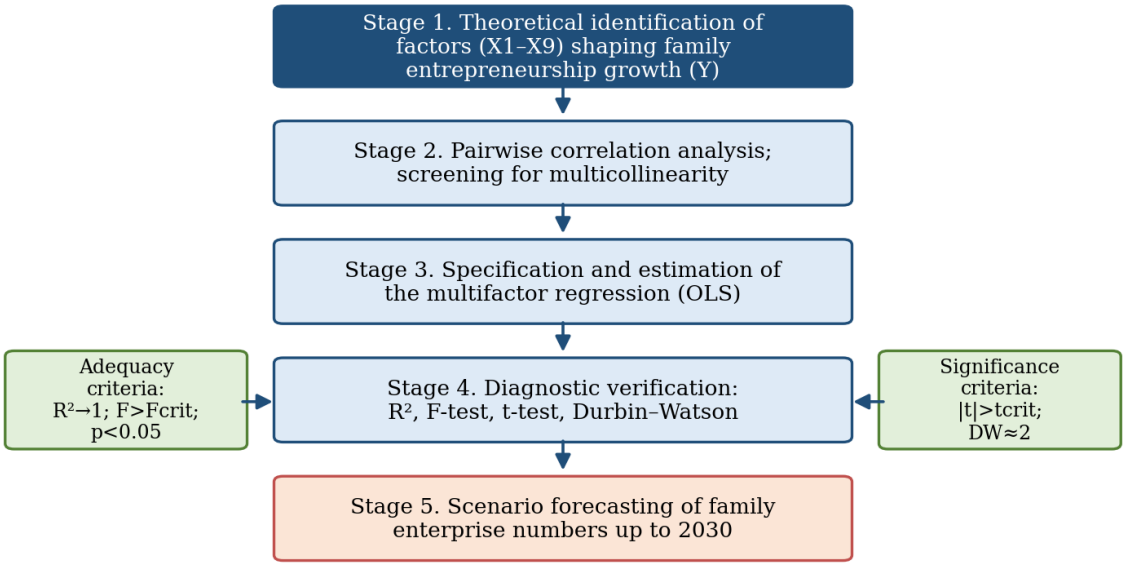

Figure 1. Hierarchical algorithm of econometric modelling of family entrepreneurship growth in tourism[2]

ANALYSIS AND RESULTS

Over the observation period, the dependent variable increased more than threefold, rising from 7,340 family enterprises in 2011 to 24,300 in 2025. A temporary decline was observed in 2020, when the number of family enterprises decreased to 16,700, followed by subsequent recovery and continued growth. Table 2 presents the key indicators for selected years (Table 2).

Table 2

Dynamics of the resulting indicator and principal factors, 2011–2025 (selected years)[3]

Year	Y, family enterprises, units	X2, income of population, bln UZS	X4, tourist services exports, mln USD	X9, tourism investment, bln UZS
2011	7,340	8,593.3	232.6	173.4
2013	9,700	12,626.8	486.3	305.1
2015	12,440	16,934.4	634.8	514.7
2017	16,400	24,934.6	950.6	731.9
2019	18,240	38,138.7	1,313.1	1,052.1
2020	16,700	43,118.2	260.9	1,428.1
2021	19,207	53,845.1	422.1	1,956.1
2023	21,358	75,608.4	2,143.5	2,118.1
2025	24,300	98,471.3	3,294.3	3,210.6

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At the screening stage, pairwise correlation coefficients between the dependent variable (Y) and each candidate explanatory factor were calculated (Table 3). All nine factors demonstrate a strong positive relationship with the dependent variable. The strongest associations were observed for GDP (0.984), exports of tourism services (0.959), retail turnover (0.936), investment in tourism (0.911), and population income (0.921 in logarithmic form).

At the same time, substantial correlations were identified among the explanatory variables themselves, with many coefficients exceeding 0.92, indicating a high degree of interdependence between the factors. Under such conditions, the inclusion of all nine regressors in a single regression equation may reduce the reliability of individual parameter estimates. This conclusion was confirmed during preliminary model estimations, where the statistical significance of individual coefficients was limited according to the Student t-test criterion. Therefore, a more parsimonious specification was required to ensure the robustness and interpretability of the econometric model (Table 3).

Table 3

Pairwise correlation of candidate factors with the resulting indicator Y[4]

Indicator	X1	X2	X3	X4	X8	X9
Correlation with Y	0.984	0.798	0.656	0.959	0.936	0.778
Assessment of link	very strong	strong	notable	very strong	very strong	strong

In response, a parsimonious specification strategy was adopted. The explanatory variables were entered individually in log–log form, and competing single-factor models were compared using the adjusted coefficient of determination (Adjusted R^2), the Fisher F-statistic, and parameter significance tests. The best-performing specification relates the logarithm of the number of family enterprises to the logarithm of investment directed to the tourism sector:

$$\ln Y = 6.967 + 0.393 \cdot \ln X_9$$

The diagnostic results indicate a high level of model performance. The coefficient of determination (R^2 = 0.941; Adjusted R^2 = 0.937) shows that variation in tourism investment alone explains approximately 94 per cent of the variation in the number of family enterprises. The Fisher statistic (F = 207.8) substantially exceeds its critical value ($p < 0.001$), confirming the overall significance of the model. The Student's t-statistics for the intercept and slope coefficients are 37.5 and 14.4, respectively, both indicating a high degree of statistical reliability.

An alternative specification based on population income,

$$\ln Y = 5.022 + 0.446 \cdot \ln X_2,$$

also demonstrates strong explanatory power (R^2 = 0.918; F = 145.7), confirming that purchasing power represents an additional and closely related channel influencing the development of family enterprises.

The Durbin–Watson statistic in the level specification (0.73) suggests the presence of temporal dependence in the residuals, a characteristic frequently observed in relatively short macroeconomic time series exhibiting a common growth trend. To verify the robustness of the results, an additional estimation in first differences was conducted. The results preserved a positive and statistically significant short-run elasticity, supporting the stability of the estimated relationship. Therefore, the long-run relationship reported above is regarded as the principal empirical finding of the study. The goodness of fit of the preferred model is illustrated in Figure 2.

The economic interpretation of the slope coefficient is straightforward: a one per cent increase in investment directed to the tourism sector is associated, on average, with a 0.393 per cent increase in the number of family enterprises. An elasticity below unity is consistent with the structure of investment flows, as a considerable share of investment is allocated to large-scale hotel, transport, and tourism infrastructure projects. Nevertheless, the estimated coefficient confirms that investment in tourism contributes positively to the development of household-scale enterprises through improvements in infrastructure, destination attractiveness, and demonstration effects that encourage entrepreneurial activity.

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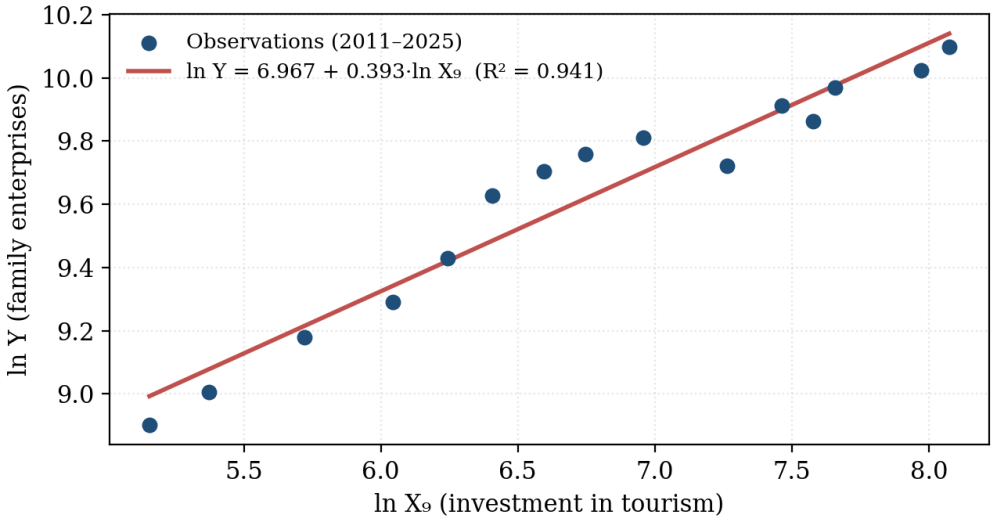

Figure 2. Scatter of ln Y against ln X_9 with the fitted regression line, 2011–2025[5]

The verified model was subsequently applied for scenario forecasting. Tourism investment is assumed to continue its growth trend observed during 2020–2025, with an average annual growth rate of 17.6 per cent. This assumption is consistent with the objectives and targets outlined in the "Uzbekistan – 2030" Development Strategy. By incorporating the projected investment trajectory into the estimated regression equation, the forecast results presented in Table 4 and Figure 3 were obtained.

Table 4

Forecast of the number of family enterprises in the tourism sector of Uzbekistan, 2026–2030[6]

Indicator	2026	2027	2028	2029	2030
Family enterprises, units (forecast)	27,007	28,782	30,675	32,691	34,841
Growth on previous year, %	111.1	106.6	106.6	106.6	106.6

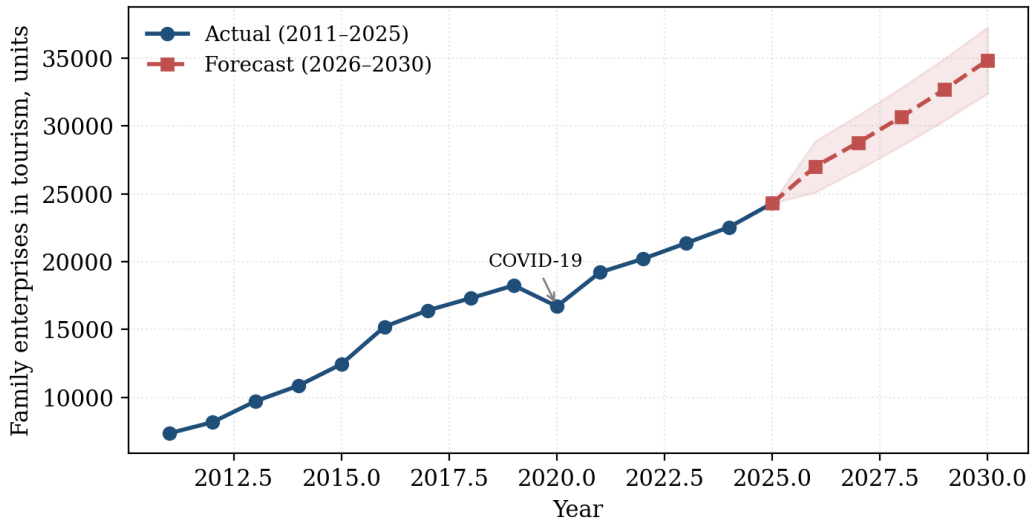

Figure 3. Actual (2011–2025) and forecast (2026–2030) dynamics of family enterprises in the tourism sector[7]

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Under the baseline scenario, the number of family tourism enterprises is projected to increase by approximately 43 per cent during 2026–2030, reaching nearly 34.8 thousand units by the end of the forecast period. The shaded interval presented in Figure 3 (±7 per cent) illustrates the potential variation in forecast outcomes under different investment growth assumptions. Even under the more conservative scenario represented by the lower limit of the interval, the number of family tourism enterprises is expected to exceed 32 thousand units by the end of the decade. These results indicate a stable growth trajectory for family entrepreneurship in the tourism sector and highlight the important role of investment in supporting its further development.

CONCLUSIONS AND RECOMMENDATIONS

First, the growth of family entrepreneurship in Uzbekistan's tourism sector is closely linked to the broader investment cycle. The log-linear model, in which sectoral investment is used as the sole explanatory variable, explains approximately 94 per cent of the variation observed during 2011–2025 and demonstrates strong statistical significance according to the Fisher and Student criteria. Therefore, investment policy can be regarded as an important instrument for supporting the development of family business in tourism.

Second, the estimated elasticity of 0.39 indicates that the objectives of the national tourism strategy can be supported through capital deepening; however, relying solely on investment may not ensure sufficiently rapid growth in the number of family enterprises. Doubling the number of enterprises through investment alone would require investment to increase almost sixfold. For this reason, complementary instruments — preferential microcredit, simplified registration procedures, land allocation, and skills training within the framework of the "Every Family is an Entrepreneur" programme — should be maintained and expanded. These instruments can strengthen the overall development effect by improving the baseline conditions for family entrepreneurship.

Third, the 2020 observation shows that family tourism enterprises are sensitive to demand fluctuations: the number of enterprises decreased by 8.4 per cent in that year. To enhance the resilience of the sector, it is advisable to introduce a standing stabilisation mechanism, including temporary tax deferrals and bridge credit activated in crisis periods. Such measures would help reduce business exits and preserve the accumulated entrepreneurial capacity of family enterprises.

Fourth, the forecast for 2030, which indicates approximately 34.8 thousand family enterprises, provides regional administrations with a quantitative benchmark for planning and monitoring. Further research may focus on disaggregating the national model by region and expanding the set of explanatory factors by including digitalisation indicators as longer statistical series become available.

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