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Article

Analysis of Processing Industry Enterprise Performance Based on Economic Indicators Utilizing Trend Models

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Abstract: The formation of enterprises of the processing industry is a basis for sustainable socio-economic development, especially in the context of digital transformation of the economy and the recovery from the COVID-19 pandemic. Analytical assessment of industrial dynamics, based on long-term statistical trends, has come to the fore in the context of structural reforms, growing industrial production and increasing regional disparities in Uzbekistan. While industrial modeling and forecasting is examined in previous literature, few studies systematically apply trend models for evaluating processing industry performance regionally and then using the series as basis for intra- and inter-regional medium-term forecasts based on empirical time-series data. The purpose of the study is to examine the trends in economic indicators of processing industry enterprises for 2005–2025, to identify the process development trends and forecast scenarios on the basis of trend modeling. The approach used is quantitative economical econometric methods, linear and graphical trend model, regression analysis, extrapolation of parameters of econometric relative devaluation model methods, and comparative regional assessment based on official statistical data. The results depict large regional differences, stable long term industrial production growth, and expected growth of total industrial output and per capita industrial output in forecast period 2022–2026. This research combines socio-economic trend prediction with regional industrial forecasting to create a formal quantitative foundation for the analysis of management efficiency within the processing industry. This emphasizes the need to establish efficient organizational and economic management tools designed to sustainable competitiveness of the region, to ensure effective development of regional industries, and to increase the level of strategic planning in the processing industry enterprises.

Keywords: processing industry enterprises, digital economy, marketing, management efficiency, trend, trend models and forecast.

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1. Introduction

Currently, significant scholarly attention is directed toward modern research addressing the restoration of the socio-economic standing of processing industry enterprises. Within the digital economy environment, enhancing competitiveness by mobilizing new opportunities to effectively utilize the potential of the processing industry is considered one of the most pressing contemporary issues [1][2].

Trends observed in the sector have formed the basis for comprehensive reforms aimed at developing industrial enterprises as a strategic sector of Uzbekistan's national economy. In 2021, the Republic of Uzbekistan produced industrial goods valued at 456,056.1 billion

UZS a 23.7% increase compared to the previous year thereby establishing a favorable institutional and socio-economic environment [3].

While the global impact of the 2020 pandemic caused an economic downturn within the manufacturing industry, it also established the foundation for an intense competitive environment in subsequent development trends. Today, systematic reforms are being implemented to create a favorable investment climate and protect the rights and legal interests of private property owners [4]. However, delays in transitioning to market mechanisms in certain sectors and large enterprises where the state share is maintained hinder the production of new types of competitive products, the implementation of advanced technologies, the increase of labor productivity, and the creation of new jobs through the active attraction of private capital. The primary objective of delivering finished products with added value to the world market is the deep processing of raw materials[5][6]. If goods are brought to market in a consumer-ready state, it ensures:

1. Increased employment for the population;
2. Appreciation of the national currency;
3. Market saturation with diverse products;
4. A guaranteed increase in the welfare and living standards of the people.

To ensure the further development of this sector, practical measures are being consistently implemented. The President of the Republic of Uzbekistan has issued several decrees regarding the rapid development of processing industry enterprises:

Decree of July 24, 2019: On measures to further improve the regulation of the production and realization of certain types of excisable products [7].

Decree of July 12, 2019: On increasing the amounts of wages, pensions, stipends, and allowances.

Decree of June 27, 2019: On measures to further regulate the provision of tax and customs benefits.

Decree of June 7, 2019: On measures to simplify the procedures for the liquidation of business entities.

Decree of May 27, 2019: On measures to further improve the anti-corruption system in the Republic of Uzbekistan.

Decree of May 15, 2019: On measures to designate the Navoi region as a free economic zone for innovative, high-tech, export-oriented, and import-substituting productions [8].

Decree of May 14, 2019: On measures for the radical improvement of the system for supporting and protecting entrepreneurial activity.

According to global statistical data (International and Domestic Statistics, UNIDO), most economic successes in developing and newly industrialized nations are explained by deep structural changes in industry, particularly in the processing sector. Specifically, these countries account for 44.6% of the value added in the global processing industry and 34.6% of exported products. Research indicates that the industrial sector also plays a vital role in job creation; specifically, the creation of one job in the processing industry leads to the creation of two or three jobs in other sectors [9].

Today, the development of the industrial sector is also crucial for the national economy. Specifically, this sector accounts for:

1. 25.7% of the total value added of sectors in the national GDP;
2. 13.6% of total employment in the economy;
3. 39.4% of investments in fixed capital by types of economic activity.

Theoretical and practical aspects of modeling and forecasting socio-economic processes, the construction of input-output models, and econometric research on technical progress and economic growth have been deeply studied in the works of international economists such as V. Leontief, R. Lucas, M. Hirooka, and J. Madsen [10].

The modeling and forecasting of processing industry production processes, multi-criteria optimization of production, regional industrial development, and the classification of its multi-dimensional dynamics have occupied an extensive place in the scientific

research of L.V. Kantorovich, V.N. Burkov, V.K. Kontorovich, N.G. Andronnikova, and V.A. Kolemayev [11][12].

Similarly, the modeling of socio-economic processes remains a subject of scientific interest for economists in our republic. Specifically, the scientific works of renowned national scholars such as V.K. Kabulov, S.S. Gulyamov, B.Y. Khodiev, B.T. Salimov, and Kh.S. Mukhitdinov have extensively researched the modeling and forecasting of production, socio-economic processes under complex ecological conditions, forecasting trends in small business development, factors and econometric models of sustainable socio-economic growth, and the modeling of the formation and development of agriculture and the rural labor market [13][14][15].

While the research of the aforementioned scholars holds a significant place in this field, every problem requires a unique solution tailored to a specific time and space.

2. Methodology

This research employs a quantitative econometric approach for modeling the development dynamics of processing industry enterprises in terms of trend models and modeling forecasting. The research is based on regional official statistical data for the period 2005–2025. Data were organized and cleaned by years, so that the time-series data were processed to be consistent and comparable across years. The first analytical technique used is trend analysis because linear and graphical trend models were developed to find long-term growth tendencies and structural changes in industrial production. Using time as a variable, regression equations were estimated to reflect the functional dependence of output indicators on time, which allowed for the determination of growth rates and cyclical dynamics. Trend functions were estimated and then used to extrapolate back the values of the main production volumes and per capita industrial output for 2022–2026. It was also utilized for comparative regional analyses to evaluate differences in industrial concentration and development levels between territories. Percentage shares, growth coefficients, and structural shares were assessed using descriptive statistical tools. Incorporating elements of economic growth theory and regional development modeling, the methodological framework is characterized by both theoretical depth and empirical grounding. The graphs and tables were used to present data in a more clear and reliable way. The concept of the belt ensures that the conclusions about the efficiency of management and development prospects of processing industry enterprises will be based on comprehensive quantitative assessment.

3. Results and Discussion

When discussing the use of econometric models in managing the development of processing industry enterprises in our country, we refer to the creation of an ecological system that includes an interactive map of the country and a unified database of existing tourism resources of its tourism regions, as well as their tourism potential. At the same time, there must be open access to tourism services in Uzbekistan, and its service sector must be constantly updated. This serves as an effective tool for managing tourist flows and leads to the development of the tourism and recreational potential of certain regions of Uzbekistan. A regional ecological portal can serve as a source for disseminating rapid, complete, and reliable information about the tourism and recreational potential of the region. This allows for the effective resolution of many problems in tourism management, increasing competitiveness, and increasing the flow of foreign tourists.

In resolving problems related to the management and development of the ecological tourism service sector within the country, it is appropriate to define the following tasks:

1. Distribution of regional objects based on ecological maps, taking into account the natural-climatic conditions of the area;

2. Identification, classification, and certification of historical monuments while maintaining their condition in the regions;
3. Placement of historical monuments and hotel facilities on electronic maps;
4. Proper organization of advertising services in the development of tourism services in the regions.

Assessing the status of tourism being utilized while shaping it in the regions of our country serves as a basis for determining development prospects, specifically through natural climates and historical monuments. Both groups are of high importance in the development of the tourism business. However, the resource potential of each region differs according to the quantitative and qualitative aspects of the resources. Comprehensive assessments of the country's geographical tourism potential by international experts have found it to be at a high level, showing extreme attractiveness for foreign and local tourists. Therefore, it is appropriate to use Public-Private Partnership (PPP) mechanisms in forming the marketing budget aimed at bringing Uzbekistan into the global tourism market. This reduces the level of uncertainty in the information system regarding sources for developing ecological tourism in the regions, promotes regional tourism products more effectively, and forms a positive tourism reputation for the region (Table 1).

Table 1. Industrial products of recycling by region in 2025

№	Region (english)	Value (in mln uzs)	Percentage (%)
1	Tashkent city	35,424.2	23%
2	Andijan	25,823.9	17%
3	Tashkent region	19,981.5	13%
4	Samarkand	14,381.9	9%
5	Fergana	11,763.9	8%
6	Khorezm	8,591.6	5%
7	Bukhara	8,570.2	5%
8	Namangan	8,303.8	5%
9	Kashkadarya (highlighted in red)	4,660.9	**3%**
10	Navoi	4,342.5	3%
11	Jizzakh	4,009.7	3%
12	Sirdaryo	3,718.9	2%
13	Republic of karakalpakstan	2,945.6	2%
14	Surkhandarya	2,640.6	2%

Table 1 illustrates the distribution of indicators across the regions of Uzbekistan in the form of a pie chart. Based on the provided data, the following brief analysis is conducted: Regions with the highest share. The following regions constitute the largest portion of the total indicators:

1. Tashkent city: 35,424.2 (23%) – The largest share, representing nearly a quarter of the total figure.
2. Andijan: 25,823.9 (17%) – Holds the second-highest position.
3. Tashkent region: 19,981.5 (13%).
4. Samarkand: 14,381.9 (9%).
5. Fergana: 11,763.9 (8%).

These regions form the bulk of the overall indicator. Notably, Tashkent city and Tashkent region combined account for 36% of the total. Regions with a moderate share (3–5%). Each of the following regions has made a moderate contribution:

1. Bukhara: 8,570.2 (5%).
2. Khorezm: 8,591.6 (5%).
3. Namangan: 8,303.8 (5%).
4. Navoi: 4,342.5 (3%).
5. Kashkadarya: 4,660.9 (3%).
6. Jizzakh: 4,009.7 (3%).

Regions with the lowest share

The shares of these regions are the smallest, each hovering around 2%:

1. Republic of Karakalpakstan: 2,945.6 (2%).
2. Sirdaryo: 3,718.9 (2%).
3. Surkhandarya: 2,640.6 (2%).

The largest share is attributed to Tashkent city.

The regions of the Fergana valley collectively occupy a significant share.

The Republic of Karakalpakstan, Sirdaryo, and Surkhandarya record the lowest indicators.

There is a significant disparity between regions a substantial gap exists between the highest and lowest recorded figures (Table 2).

Table 2. The volume of processing industry output and industrial output per capita in our republic

	Volume of industrial output in Kashkadarya region (in billion soums)	**Industrial output per capita in Kashkadarya region (in thousand soums)**
2005	240,8	107,8
2006	377,9	166,2
2007	564,1	243,6
2008	805,3	341,6
2009	1 436,3	598,6
2010	2 018,2	826,7
2011	2 446,4	984,1
2012	3 306,6	1303,6
2013	4 461,6	1722,8
2014	4 957,5	1857,1
2015	5 043,6	1833,8
2016	6 076,4	2166,7
2017	6 849,4	2392,1
2018	7 194,7	2458
2019	8 721,9	2914,8
2020	9 632,2	3150,7
2021	7 351,2	3509,9
2022	9 992,0	4568,0
2023	12 562,6	6270,9
2024	14 612,3	4417,4

	Volume of industrial output in Kashkadarya region (in billion soums)	Industrial output per capita in Kashkadarya region (in thousand soums)
2025	18 771,9	5567,2

If we analyze the trends in the number of hotels and visitors in the regions of the Republic of Uzbekistan for 2005-2025, the number of hotels and similar accommodation facilities increased by 4.82 times in 2025 compared to 2005, and by 1.1 times compared to 2019. The number of tourist companies and organizations increased by 2 times in 2019 compared to 2005, but due to the COVID-19 pandemic, in 2025 it decreased by 0.5 times compared to 2019, that is, it had the same result as the 2005 indicator.

The total number of places in hotels and similar accommodation facilities (facilities) increased by 2.94 times in 2025 compared to 2005, and by 1.08 times compared to 2019. The number of visitors in our country increased by 3.8 times in 2019 compared to 2005, and by 2025 due to the pandemic, this indicator is 1.23, that is, the number of visitors in 2025 decreased by 68% compared to 2019 (Fig 1).

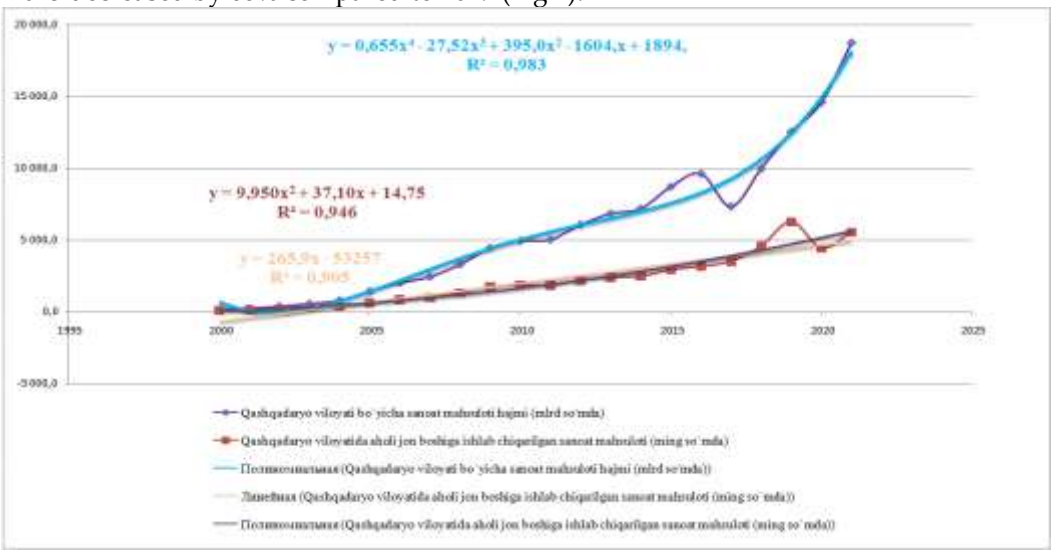

Figure 1. Graphical and linear trend models of industrial enterprises in the Republic of Uzbekistan

Forecast options were developed based on trend models built based on the trends in the number of tourist firms and organizations in our country, hotels and similar accommodation facilities (facilities) and the number of places in them, and the number of accommodated visitors (Table 3), as shown in Figure 1.

Table 3. Forecast of industrial output volume and per capita industrial output for Kashkadarya region

Years	Volume of industrial output in Kashkadarya region (in billion soums)	Industrial output per capita in Kashkadarya region (in thousand soums)
2022	22417,02	6131,6
2023	27794,8	6636,35
2024	34528,38	7161
2025	42837,76	7705,55
2026	52958,7	8270

As you can see in Table 3, the trends in the volume of industrial output and per capita industrial output for the Kashkadarya region are forecasted for 2022-2026. Based on this, the volume of industrial output in the Kashkadarya region is projected to increase by 2.36 times compared to 2022 by 2026, and the per capita industrial output is projected to increase by 1.35 times compared to 2022 by 2026.

4. Conclusion

In the conditions of the digital economy and the pandemic, it is necessary to study the specific scientific and methodological foundations of the management system of marketing activities of processing industry enterprises, determine the main directions of activity in this sector, create an effective management system in the industry, as well as form management activities and structure, and develop a mechanism for effective management of the activities of enterprises. Based on the production efficiency of the regions, increasing the effectiveness of management mechanisms in the development of processing industry enterprises, and effectively organizing the organizational and economic mechanism of the activities of enterprises should be considered as the main direction in ensuring economic development. The organizational and economic mechanism for the development of marketing activities of processing industry enterprises includes management subjects, management functions, management objects, communication system, management methods, management goals and objectives, and requires their operation in an effective system. All elements of the organizational and economic mechanism are inextricably linked, and their complementarity is the main criterion for their effective functioning in the market.

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