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THE ROLE OF INDUSTRIAL ENTERPRISES IN THE ECONOMY OF BUKHARA REGION AND THEIR DEVELOPMENT TRENDS: AN ANALYSIS OF STRUCTURAL CHANGES AND REGIONAL CONCENTRATION

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Abstract. This study examines the dynamics, structural transformation, and regional concentration of industrial development in Bukhara region, Uzbekistan, during 2010–2025. The analysis is based on official regional statistical data covering industrial output, sectoral composition, enterprise demography, labor productivity, investment activity, and the territorial distribution of industrial production. Descriptive statistical analysis, structural change assessment, and regional concentration methods are used to identify the key drivers and constraints of industrial development.

Keywords: industrial development; structural transformation; regional concentration; manufacturing industry; Bukhara region; Uzbekistan.

Аннотация. Настоящее исследование посвящено анализу динамики, структурной трансформации и территориальной концентрации промышленного развития Бухарской области Республики Узбекистан в период 2010–2025 годов. Анализ основан на официальных региональных статистических данных, охватывающих объёмы промышленного производства, отраслевую структуру, демографию предприятий, производительность труда, инвестиционную активность и территориальное распределение промышленного производства. Для выявления ключевых факторов и ограничений промышленного развития применяются методы описательного статистического анализа, оценки структурных изменений и анализа региональной концентрации.

Ключевые слова: промышленное развитие; структурная трансформация; региональная концентрация; обрабатывающая промышленность; Бухарская область; Узбекистан.

INTRODUCTION

Over the last decade and a half, Uzbekistan has implemented large-scale economic reforms aimed at accelerating industrialization, enhancing export capacity, and strengthening regional economic competitiveness. Industrial policy has become one of the central pillars of national development strategies, particularly within the framework of the Uzbekistan–2030 Strategy. In this context, understanding regional patterns of industrial development has become increasingly important for both policymakers and researchers [2; 3; 5].

Among Uzbekistan's regions, Bukhara occupies a distinctive position due to its rich natural resource base, established manufacturing traditions, and strategic role in the national energy sector. The region hosts significant petroleum refining, gas processing, textile, food processing, and construction materials industries,

making it one of the country's important industrial territories.

Between 2010 and 2025, the industrial sector of Bukhara region experienced substantial growth. Total industrial output increased from approximately 1.67 trillion UZS in 2010 to 53.49 trillion UZS in 2025, representing a nearly thirty-two-fold increase. This transformation was accompanied by major changes in sectoral composition, enterprise structure, investment patterns, and the territorial distribution of production.

Despite these achievements, certain issues remain regarding the sustainability of such growth, particularly in view of increasing industrial concentration in petroleum-related activities and persistent spatial disparities among districts. Regional statistics indicate that Qorovulbozor district alone generated more than 40 percent of total industrial output by 2024, suggesting a high degree of territorial concentration. Similarly, the manufacturing structure became increasingly dependent on petroleum refining and coke production activities. These trends highlight the importance of further strengthening economic resilience, diversification, and long-term regional sustainability.

The existing literature on industrial development emphasizes that sustainable economic growth depends not only on expanding production volumes but also on diversification, innovation, and balanced spatial development. Regions characterized by excessive sectoral specialization may become more vulnerable to external shocks, commodity price fluctuations, and technological changes. Therefore, examining the structural characteristics of industrial growth in Bukhara region represents an important contribution to the broader discussion on regional industrial policy in emerging economies.

The main objective of this study is to evaluate industrial transformation in Bukhara region during 2010–2025 through the analysis of production dynamics, sectoral structure, enterprise demography, labor productivity, investment activity, and territorial concentration. The study seeks to identify both the strengths and structural limitations of the region's industrial development model and to formulate policy recommendations aimed at achieving more balanced and sustainable industrial growth.

LITERATURE REVIEW

Industrial transformation is widely recognized as a key driver of economic development and structural change. Classical scholars such as W. Arthur Lewis, Simon Kuznets, and Hollis Chenery argue that sustainable economic growth is associated with the reallocation of resources from low-productivity sectors to higher-productivity industrial activities. Industrialization contributes to productivity growth, employment creation, and export expansion [12; 13; 14].

Recent studies have increasingly emphasized the regional dimension of industrial development. Andrés Rodríguez-Pose highlights that uneven regional growth may intensify spatial disparities, while Ron Boschma and Koen Frenken stress the importance of industrial diversification in enhancing regional resilience. Similarly, Paul Krugman and Michael Porter demonstrate that industrial concentration can generate agglomeration advantages, although excessive specialization may increase vulnerability to external shocks [19; 20].

Studies by Ricardo Hausmann, Jason Hwang, Dani Rodrik, and César Hidalgo show that diversification and production complexity are important determinants of long-term industrial competitiveness [17; 18; 21; 22].

In Uzbekistan, issues of industrial modernization, regional development, and economic diversification have been examined by scholars such as Qalandar Abdurahmonov, Baxtiyor Xodiyev, A. Vahobov, and N. Yuldashev. Their studies emphasize the importance of industrial diversification, investment activity, and balanced territorial development in increasing regional competitiveness. However, empirical research devoted specifically to industrial transformation and territorial concentration at the regional level remains limited [6; 7; 8; 9; 10; 11].

Therefore, this study contributes to the existing literature by providing a comprehensive assessment of industrial growth, structural transformation, and regional concentration in Bukhara region during 2010–2025, thereby filling an important gap in regional industrial development research.

RESEARCH METHODOLOGY

The study is based on official statistical data published by the Bukhara Regional Department of Statistics for the period 2010–2025. The dataset includes information on industrial output, manufacturing structure, physical volume indices, district-level industrial production, enterprise demography, employment and wages, investment activity, and external trade indicators. The use of a consistent regional statistical series makes it possible to identify long-term trends and structural changes in the industrial sector [23; 24].

To examine industrial transformation in Bukhara region, the study employs four complementary analytical approaches: (1) industrial growth analysis, (2) structural transformation analysis, (3) regional concentration analysis, and (4) enterprise and productivity analysis.

Industrial growth dynamics are evaluated using annual growth rates and the compound annual growth rate (CAGR). The annual growth rate is calculated as follows:

Annual growth rate

$$GR_t = [(Y_t - Y_{t-1}) / Y_{t-1}] \times 100$$

where Y_t denotes industrial output in year t , and Y_{t-1} denotes industrial output in the previous year.

To measure long-term industrial expansion, CAGR is calculated as follows:

Compound annual growth rate

$$CAGR = (V_f / V_i)^{1/n} - 1$$

where V_f is the final value, V_i is the initial value, and n is the number of years. Based on industrial output data, the estimated CAGR is approximately 25–26 percent per year, indicating exceptionally rapid industrial growth during the study period.

Changes in the sectoral composition of manufacturing are assessed by comparing the shares of major industries over time. Particular attention is paid to petroleum refining and coke production, textile manufacturing, food processing, construction materials, and other manufacturing activities. This approach enables the identification of dominant industrial trajectories and diversification patterns.

To evaluate the spatial concentration of industrial activity, the study applies the Herfindahl–Hirschman Index (HHI) based on district-level industrial output shares.

Herfindahl–Hirschman Index

$$HHI = \sum s_i^2$$

where s_i represents the share of district i in total regional industrial production.

The index is interpreted as follows:

HHI < 0.15 — low concentration;

0.15 ≤ HHI ≤ 0.25 — moderate concentration;

HHI > 0.25 — high concentration.

Given that Qorovulbozor district accounts for approximately 42 percent of regional industrial output, preliminary estimates indicate a highly concentrated industrial structure.

Enterprise dynamics are examined through the number of active enterprises, newly established enterprises, and enterprise closures. Labor productivity is measured as industrial output per employee, which allows an assessment of whether industrial growth was accompanied by improvements in production efficiency.

The analysis is based on officially reported statistics and therefore may not fully capture informal economic activity. In addition, some indicators are available only at the regional level, which limits the application of more advanced panel econometric techniques. Nevertheless, the dataset provides sufficient coverage for a comprehensive assessment of industrial transformation and regional concentration in Bukhara region.

ANALYSIS AND RESULTS

The analysis reveals a substantial expansion of industrial activity in Bukhara region during 2010–2025. Total industrial output increased from UZS 1.67 trillion in 2010 to UZS 53.49 trillion in 2025, representing a 31.9-fold increase over the study period. This growth reflects the cumulative impact of industrial modernization, investment expansion, manufacturing development, and economic reforms implemented in Uzbekistan over the last decade.

The long-term growth trajectory is further confirmed by the compound annual growth rate (CAGR), which averaged approximately 25–26 percent per year. This rate indicates that industrial production expanded at a consistently high pace throughout the observation period, despite periodic fluctuations associated with macroeconomic adjustments and external market conditions (Table 1).

Table 1

Industrial output growth in Bukhara region (2010–2025)

Year	Industrial output (billion UZS)	Growth rate (%)	Per capita output (thousand UZS)
2010	1674.8	110.2	1016.1
2015	5143.9	111.3	2857.2
2020	17 574.4	101.5	9080.1
2023	31860.4	106.3	15719.0
2025	53490.1	107.1	25568.5

Source: Compiled by the author based on data from the Bukhara regional statistics department.

Table 1 demonstrates the remarkable growth of industrial production and per capita industrial output. The increase in per capita output from 1.0 million UZS to more than 25.5 million UZS suggests that industrial development significantly outpaced population growth during the study period (Figure 1).

Industrial output dynamics in Bukhara region

Industrial production increased significantly between 2010 and 2025.

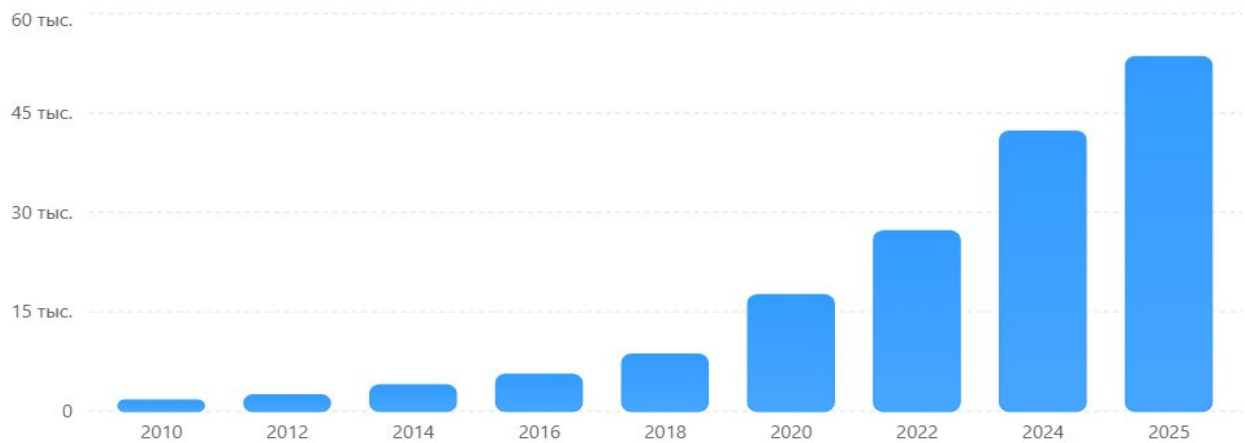


Figure 1. Industrial output dynamics in Bukhara region¹

Figure 1 clearly illustrates the upward trajectory of industrial development. The most pronounced increase occurred after 2020, when industrial production nearly tripled within five years. This period coincided with intensified industrial investment, modernization projects, and the expansion of manufacturing activities.

To better understand the dynamics of industrial development, the study divides the growth process into three major stages, as presented in Table 2.

Table 2
Stages of industrial development in Bukhara region

Period	Industrial output (trillion UZS)	Main characteristics
2010–2016	1.67 → 5.57	Gradual industrial expansion
2017–2020	6.42 → 17.57	Reform-driven acceleration
2021–2025	20.77 → 53.49	Rapid industrial growth
2010–2025	1.67 → 53.49	Long-term structural transformation

Source: Author’s calculations.

The first stage was characterized by gradual industrial expansion and infrastructure development. The second stage coincided with economic liberalization reforms and improvements in the investment climate. The third stage was marked by rapid industrial growth, driven primarily by manufacturing expansion and capital-intensive production activities (Figure 2).

¹ author’s development

Industrial production growth rates

Annual industrial production indices showing sustained real growth.

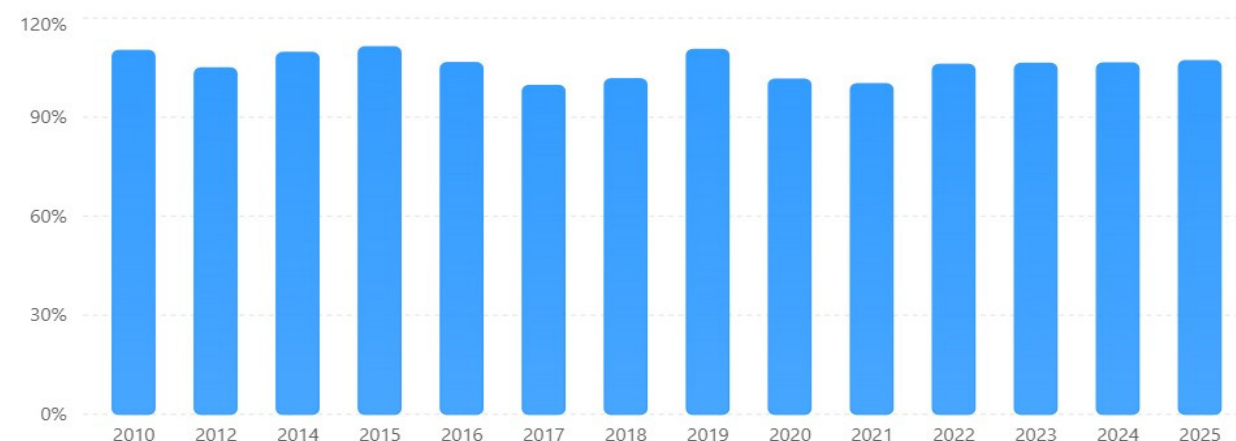


Figure 2. Industrial production growth rates²

Figure 2 confirms that industrial growth was not merely the result of inflationary effects. Industrial production indices remained above 100 percent in most years, indicating sustained growth in real output. Consequently, the observed expansion reflects genuine improvements in production capacity and industrial performance.

The findings are consistent with structural transformation theory, which argues that industrialization serves as a key mechanism for enhancing productivity, competitiveness, and regional economic growth. Therefore, Bukhara region can be regarded as one of the most rapidly industrializing regions of Uzbekistan during the study period.

One of the most significant features of industrial development in Bukhara region during 2010–2025 was the substantial transformation of the manufacturing structure. Although manufacturing remained the dominant component of regional industry throughout the study period, important changes occurred in the relative contribution of individual sectors.

The data indicate a growing concentration of manufacturing activity in petroleum refining and coke production. By 2024, this sector accounted for 44.2 percent of total manufacturing output, making it the largest industrial activity in the region. Food processing and textile manufacturing accounted for 22.9 percent and 16.0 percent, respectively, while construction materials contributed 5.3 percent of total manufacturing production (Figure 3).

Sectoral structure of manufacturing industry

Distribution of manufacturing output across major industrial sectors in 2024.

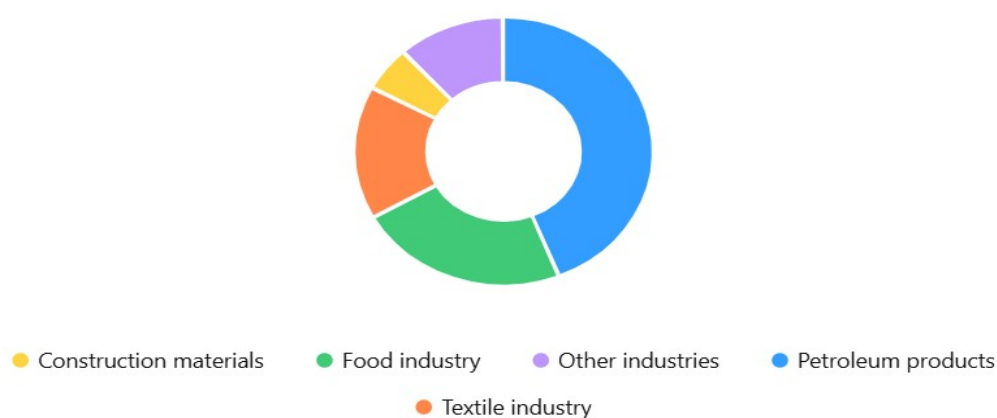


Figure 3. Sectoral structure of manufacturing industry³

² author's development

³ author's development

The results suggest that industrial growth in Bukhara region has increasingly relied on petroleum-related manufacturing activities. The expansion of this sector was largely supported by the modernization of refining facilities, rising investment inflows, and the strategic importance of energy-related industries within the regional economy.

At the same time, the relative share of textile manufacturing declined despite positive growth in absolute production volumes. This finding indicates that the growth of petroleum processing significantly outpaced the development of traditional manufacturing sectors. Similar structural shifts have been observed in other resource-rich regions where industrial expansion is closely linked to energy-based activities.

From the perspective of structural transformation theory, the observed changes reveal both opportunities and risks. On the one hand, petroleum-related industries generally demonstrate higher labor productivity, larger investment volumes, and stronger fiscal contributions. On the other hand, excessive dependence on a single industrial sector may increase vulnerability to commodity price fluctuations and external demand shocks.

Therefore, the evidence suggests that future industrial policy should focus on strengthening diversification through the development of higher-value-added manufacturing activities, particularly in textiles, chemicals, pharmaceuticals, and food processing.

In addition to sectoral concentration, industrial development in Bukhara region also exhibits pronounced territorial concentration. Although industrial activity expanded across most districts during the study period, production remained heavily concentrated in a limited number of territories.

The most notable example is Qorovulbozor district, which generated approximately 41.8 percent of total regional industrial output in 2024. This figure exceeds the combined contribution of several other districts and highlights the dominant role of a single industrial center within the regional economy.

The territorial distribution of industrial production reveals a high degree of spatial concentration. The dominant position of Qorovulbozor can largely be explained by the location of major petroleum-processing enterprises and associated industrial infrastructure. The concentration of large-scale industrial facilities creates agglomeration advantages, including economies of scale, specialized labor markets, and infrastructure efficiency.

However, from a regional development perspective, excessive concentration may also create important challenges. A highly concentrated industrial structure increases the vulnerability of regional output to disruptions affecting a small number of enterprises or locations. Furthermore, concentration may contribute to widening disparities in income, employment opportunities, and investment attraction across districts.

This concentration pattern is also reflected in preliminary Herfindahl–Hirschman Index (HHI) estimates, which indicate a highly concentrated industrial structure according to internationally accepted thresholds. This finding confirms that industrial development in Bukhara region has not been fully spatially balanced despite substantial overall growth.

Consequently, future industrial policy should encourage the establishment of industrial parks, special economic zones, and investment projects in less industrialized districts. Such measures would contribute to a more balanced territorial distribution of industrial activity while reducing structural dependence on a limited number of industrial centers.

CONCLUSION AND RECOMMENDATIONS

This study examined the dynamics, structural transformation, and regional concentration of industrial development in Bukhara region during 2010–2025 using official regional statistical data. The analysis covered industrial output growth, manufacturing structure, territorial distribution of production, and key indicators of industrial development.

The findings reveal that Bukhara region experienced significant industrial expansion over the study period. Total industrial output increased from UZS 1.67 trillion in 2010 to UZS 53.49 trillion in 2025, representing a 31.9-fold increase. The estimated compound annual growth rate of approximately 25–26 percent confirms sustained and rapid industrial growth. These results indicate that industrialization has become one of the main drivers of regional economic development.

The study also identified substantial structural changes within the manufacturing sector. Petroleum refining and coke production emerged as the dominant industrial activity, accounting for 44.2 percent of manufacturing output by 2024. While sectors such as food processing and textile manufacturing continued to grow in absolute terms, their relative importance declined. This trend suggests an increasing specialization of the regional industrial structure toward petroleum-related activities.

In addition to sectoral concentration, the analysis revealed a high degree of territorial concentration. Qorovulbozor district generated approximately 41.8 percent of total regional industrial output, highlighting the dominant role of a single industrial center. Although industrial growth was observed across most districts, the

spatial distribution of production remains uneven. Such concentration may generate productivity advantages, but it may also increase vulnerability to sector-specific and location-specific shocks.

Overall, the results suggest that industrial development in Bukhara region has been successful in terms of output growth and industrial modernization. However, the increasing concentration of production, both sectorally and territorially, may create challenges for long-term sustainability. Therefore, future industrial policy should prioritize economic diversification, expansion of high-value-added manufacturing industries, support for innovative industrial enterprises, and a more balanced territorial distribution of industrial activity.

The findings of this study contribute to the literature on regional industrial development and provide empirical evidence for policymakers seeking to promote sustainable industrialization in Uzbekistan. Future research may extend the analysis by applying advanced methods such as Data Envelopment Analysis (DEA), Location Quotient (LQ), Shift-Share Analysis, and panel econometric techniques to evaluate industrial efficiency and regional competitiveness in greater detail.

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