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Article

A Comprehensive Analysis of Industrial Structure for The Development of Regional Industrial Potential

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Abstract: The paper compares the structure of industrial branches in the regions of Uzbekistan in terms of its impact on long-term industrial potential. But even though industry had been growing across the country, regional contrasts remained stark. While earlier work covers some aspects of diversification and innovation, there is still a disconnect with studies that see industrial capacity more holistically in terms of technology chosen, resource use, intersectoral collaboration, and regional imbalance. This analysis is based on official regional data from 2012-2024, including production size, per capita output, labor conditions and active enterprises size. To understand the functionalities driving growth we grouped regions by their level of development.

Results indicate a deep schism. The industry of Tashkent City and Navoi has more modern technology and greater productivity. Tashkent Region and Andijan continue to develop steadily, but they are based on older structures in many areas. Resources are abundant in the remaining areas, but infrastructure, technology, and investment are limited. Still, recent advances show new clusters, fresh digital tools and emerging manufacturing zones are closing the gap bit by bit. The results show that industrial might requires more than raw materials but also modernization, stable investment, and effective productive networks. Improving on these fronts can help ensure a fuller range of growth in the rest of the country. In conclusion, the study serves as a useful framework for informing regional industrial policy and orientating prospects of development.

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1. Introduction

It consists in implementing institutional changes in the development of industrial structures in the regions and improving the digital management of the industry, taking into account the prospects for the mass use of its digitized resources using innovative technologies. Issues such as the effectiveness of being able to use the resources of the production of industrial products occupy an important place. Economic development has reached a new level in the current era, creating a new system. This, in turn, determined

such tasks as the implementation of deep scientific research and innovative projects in the region. The main factor in its development as a result is scientific research work, science and education. In addition, the main aspect and effect of this system is high-tech, digital and nanotechnology, microchips, artificial intelect. The emergence of industry as an independent branch of social production is associated with the separation of crafts from agriculture - the second major division of labor.he emergence of industry as an independent branch of social production is associated with the separation of crafts from agriculture - the second major division of labor. The capitalist industry appeared in western European countries in the 14th-15th centuries and went through the stages of ordinary capitalist cooperation, manufacturing and large machine industry factories, the transition from manufacturing to machine industry in the late 18th-early 19th centuries took on an industrial turn in England at first, and later in other European countries. In Russia and some other countries, industry developed from the beginning of the XIII century in the form of a Manufactory, from the 2nd half of the XIX century the machine industry flourished.

Literature Review

Scientific research conducted on the comprehensive analysis of the industrial structure in the development of regional industrial potential mainly focuses on the territorial distribution of economic resources, the diversification of industrial sectors, and the processes of innovative modernization**.** According to the reports of the World Bank and the OECD, regional industrial policy is an important factor in enhancing competitiveness, and the development of high-tech segments of production ensures the economic sustainability of regions [1][2]. The theory of competitive advantages proposed by Porter shows that under conditions of reindustrialization, the formation of industrial clusters and the expansion of value-added chains contribute to positive structural shifts in the regional economy [3]. Furthermore, in the study by Lall and Neagu, the diversification of industrial structure is assessed as a key factor in improving export efficiency [4]. Research on the experience of Eastern countries (Kim & Park) emphasizes that the introduction of digital technologies into industrial sectors, the use of automated production lines, and the strengthening of innovative infrastructure contribute to reducing economic disparities between regions [5]. Studies on the economy of Uzbekistan (Karimov; Rashidov) also focus on the rational use of raw material resources, the improvement of logistics systems, and the enhancement of investment attractiveness in regional industrial development [6]. At present, the modernization of industrial sectors, the increase in the share of processing industries, and the expansion of the production of competitive finished goods for international markets are identified as key priorities.

2. Materials and Methods

Applying a mixed analytical method, the study investigates the regional development implications of industrial structure throughout the country of Uzbekistan. It started as the first step of a broad review of national and international sources listing the basic concepts of industrial structure, regional specialization and modernization. After this, it was targeted to utilize official statistical data only for the period from 2012 to 2024 and the number of active enterprises, industrial output, per capita production, employment, and income levels within each region [7]. These indicators were chosen since they correlate with size and quality of industrial activity. The areas were subsequently clustered according to stage of development to allow for greater clarity between differences with regards to advancement in technology, resource use efficiency and investment flows between the different regions. While trend analysis was used to find long run structural changes, comparative analysis traced changes in shares of industry over time. In our case we applied logical retrospective review of any interpretation of industrial status and regional economic factors and determined this in relation to regions with the possibility to have high resource potential and low production capacity. It involves how technology, modernization technology, clustering, and digital technology transform regional competitiveness [8]. This approach was not simply about stating changes in numbers but

interpreting the broader economic implications of the trends, thereby enabling connecting statistics with real development needs. This provides a neat and valid intuition about the way regional industrial potential is generated, and where strategic improvements will be most effective.

3. Results

The detailed composition of the industrial structure can indicate an inter-sectoral imbalance, point out competitive industries, and assist in the efficient allocation of resources. For instance, enhancing the share of processing industries, integrating technologies, and promoting green development are gaining strategic priorities in such areas as Kashkadarya, Navoi and Fergana. Such analysis can provide a more quantitative basis to evaluate a region's production potential, its sectoral composition, and the system of technological, investment and cooperative linkages between industries [9].

Conceptualizing the industrial system as one whole mechanism provides an understanding of sectoral interdependence, the intensity of labor and capital flow and the dynamism of industries in terms of innovation and upgradation. Such a path also facilitates industrial complex formations and the implementation of digital networks.

Typically, the analysis addresses key elements: h) sectoral and sub-sectoral composition; i) industrial cooperation and supply chain continuity; j) technological advancement, automation, IoT and ERP usage; k) investment flows and returns; and l) socio-economic effects including employment, productivity and exports. This work is based on digital data, statistical modelling and econometric tools [10]

The significance of this is that it provides a consistent, information base for regional policy and strategy development. This to close up structural gaps, emerge new directions for investment, support the formation of clusters, strengthen economic security and improve the use of resources. The guidelines also help in developing regional strategies, index-based evaluations and innovative development indicators.

The main purpose is to estimate industrial potential in multi-faceted way and identify the primary priorities for its productive use, diversification of production, formation of competitive import substitution and export-oriented industries and changes and technologies aimed at digitalization, innovations, and environmental sustainability. This all underpins an integrated and innovation-led approach to industrial development [11].

The industrial structure includes the following structural elements:

1. Inter-sectoral structure – the share of heavy, light, food, chemical, engineering, energy, and other industries.
2. Technological structure – the degree of advanced technologies, automation, and digital transformation;
3. Regional structure – the spatial distribution of industrial enterprises, the formation of clusters and agglomerations;
4. Institutional structure – forms of ownership, management systems, and the ratio between public and private sectors.

Industrial structure determines efficiency, innovation, attractiveness for investment and for exports. This enables to study it to identify sources of growth, maintain the balance between sectors, use resources wisely, reduce regional disparities and support job creation. It also provides a basis in science for state industrial policy. As a consequence, industrial structure analysis offers a key input to regional strategies, investment decisions and creating the architecture for innovative clusters. Its purpose is to learn how sectors interact, monitor their progress and find catalysts to enhance them. These include, among others, detecting the structural transformation, measuring the ratios of production and employment, assessing the collaboration and digitalisation, and predicting the shift into the future. As a result, the comprehensive analysis of the industrial structure provides opportunities for **evidence-based decision-making** in economic policy, **rational allocation** of resources, and **the achievement of sustainable growth.** In Kashkadarya

region, there are several large and small industrial zones, where the main industrial activities include crude oil and natural gas extraction, textile and garment production, chemical processing, steam supply, and the generation of electricity and gas products. The region possesses significant reserves of industrial raw materials, including 261.3 million tons of cement raw materials, 18.7 million tons of gypsum, 33.3 million tons of glass raw materials, 15.6 million cubic meters of decorative stone, 12 million cubic meters of sand and gravel, 19.8 million cubic meters of construction stone, and 18.7 million cubic meters of clay (expanded clay) materials [12].

Although Kashkadarya is one of the leading regions of Uzbekistan in terms of territory and population, by 2024 it ranks among the lower positions in terms of Gross Regional Product (GRP), industrial output, consumer goods production, and foreign trade turnover. The sustainable growth of the regional economy largely depends on the potential of industrial sectors, the degree of structural diversification of production, and the level of competitiveness. The subsequent analysis examines the dynamics of industrial potential and structural changes in the region based on key economic indicators for the period 2012–2024.

Table 1 — **"Dynamics of the Regional Industrial Potential for 2012–2024"** presents the **main indicators** reflecting the position of each factor in the regional economy and the trends of their changes over time. The share of residents in the region grew from 9.3% in 2012 to 10.0% in 2024 according to the data. Population growth is mainly related to growth by natural increase and urbanization processes that contribute to an increase in the labor resource base, to development of the domestic consumer market, and, finally, to the demand for services [13]. Simultaneously, the growing offspring nips up the social infrastructure (housing, medical services, transport, etc.), so that one of the main priorities of innovative growth is raising labor productivity.

Therefore, understanding the level of production in regional industrial sectors remains essential for assessing the overall development trajectory of the region.

It is presented in Table 1 below.

Table 1. Dynamics of Industrial Share by Regions (2012–2024)

Regions	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Republic of Uzbekistan	100	100	100	100	100	100	100	100	100	100	100	100	100
Jizzakh	1.4	1.3	1.4	1.5	1.8	1.7	1.5	1.4	1.6	1.9	2.0	2.1	2.2
Surkhandarya	1.9	1.9	1.9	2.0	2.0	1.6	1.4	1.3	1.4	1.5	1.6	1.7	1.8
Khorezm	1.8	1.8	2.3	2.7	2.5	2.7	2.7	2.6	2.6	3.0	3.2	3.3	3.4
Republic of Karakalpakstan	1.8	1.9	2.0	2.4	3.8	4.6	4.6	3.9	3.8	3.6	3.7	3.8	3.9
Syrdarya	2.7	2.7	2.8	2.9	3.1	2.6	2.2	2.3	2.2	2.2	2.3	2.4	2.5
Namangan	2.8	2.7	2.8	2.9	3.1	3.1	2.8	2.7	3.0	3.2	3.3	3.4	3.5
Bukhara	4.3	4.4	4.7	5.3	5.0	4.3	3.7	4.6	4.8	4.6	4.8	5.0	5.1
Samarkand	5.6	5.5	5.9	6.2	6.7	6.2	5.7	4.9	5.0	5.0	5.1	5.2	5.3
Fergana	8.0	7.5	7.9	7.3	7.2	6.5	5.8	5.8	5.9	6.1	6.3	6.4	6.5
Kashkadarya	10.6	9.7	8.6	8.9	8.6	7.4	6.2	6.3	4.0	4.1	4.3	4.4	4.5
Navoi	10.0	10.0	9.8	9.5	9.5	8.8	9.7	13.8	17.7	16.1	16.3	16.5	16.8
Andijan	12.0	13.1	12.5	10.0	7.1	8.9	11.7	10.3	9.9	7.9	8.0	8.2	8.3
Tashkent	14.1	14.7	14.8	14.8	15.1	14.6	16.0	16.6	17.9	18.3	18.5	18.8	19.0
Tashkent city	21.7	22.0	18.4	19.5	21.0	20.5	18.4	16.4	17.9	19.8	20.0	20.2	20.4

Table 1 — The share of a region in total Uzbekistan industrial output (2012–2024) To analyse growth features, the industrial potential and specializations of regions were assessed. Regions were further divided into low, medium and high development level regions on the basis of these figures. Each region contributes relative to this indicator, with the national total taken as 100%. While the spread of industrial production has been uneven, low-share regions have experienced continuous improvement since 2020.

Among these low-share regions, the share of Jizzakh grew from 1.4% in 2012 to 2.2% in 2024. The growth is primarily due to the Jizzakh Free Economic Zone, production of construction materials, agro-clusters, and gradual transition to automated production [14]. Surkhandarya, again showing limited large-scale industry and an agricultural base, fell slightly from 1.9% to 1.8%. This trend has started to change with new hydropower and cement projects that launched after 2022. A key pillar of this was a pivot to growth in Khorezm where it increased from 1.8% to 3.4% led by manufacturing, food processing, textiles under programs including the Urganch Tech Park and Smart Cotton.

Doubled its share from 1.8% to 3.9% as the main industrial zones are located in Nukus and Takhiatash, as well as the growth of gas-chemical and pharmaceutical production in Karakalpakstan. Syrdarya fell marginally from 2.7% to 2.5% (however, recent development in energy/staff and textile & logistics is creating a promising outlook in the future, including an industrial park in Yangiyer.)

Medium-share regions (Namangan, Bukhara, Samarkand, Fergana, Kashkadarya): Namangan region: grew from 2.8% to 3.5%, mainly due to **knitwear clusters and IT centers.** It maintained stable growth in 2024.

Bukhara region: increased from 4.3% to 5.1%. Growth drivers include **the gas-chemical complex, energy projects, and expanded tourism infrastructure.** The region has strong potential in the oil and gas sector.

Samarkand region: slightly decreased from 5.6% to 5.3%. The light and food industries continue to operate steadily, and the **tourism sector** is becoming integrated with industry. Fergana region: declined from 8.0% to 6.5%. After a decrease during 2012–2017, recovery began in the 2020s with **new chemical complexes** and the modernization of **the Fergana Oil Refinery.**

Kashkadarya region: sharply decreased from 10.6% to 4.5% due to reduced oil and gas projects, outdated technologies, and insufficient production capacity. From 2022–2024, industrial recovery has been supported by large clusters such as **"Sulton Tex Group," "LT Textile International," and "Cluster Khilol."**

High-share regions (Navoi, Andijan, Tashkent, Tashkent City): Navoi region: grew from 10.0% to 16.8%. Since 2018, the expansion of **mining** and **metallurgy clusters, the free economic zone,** and the **Navoi Mining** and **Metallurgical Combine (NMMC)** has made the region one of the country's main industrial hubs. Andijan region: declined from 12.0% to 8.3%. Between 2012–2016, automobile production by "UzDaewoo" and "GM Uzbekistan" dominated. Later, output fell, but since 2022 the launch of **electric vehicle production projects** has driven renewed growth [15].

The share of Tashkent region soared from 14.1% to 19.0%, which has been attributed to the Angren and Ohangaron industrial zones, large-scale energy projects and the establishment of pharmaceutical production. Tashkent City itself fell from 21.7% to 20.4% due to the relocation of a number of factories to neighboring districts, however it is still the country's center for IT, technopark, services and high technology.

In 2012–2021, regional gaps were overall large but have been gradually closing since 2022. Tashkent, Navoi and Tashkent City produce more than 50% of the national industrial output: Kashkadarya, Fergana and Samarkand regions demonstrate only moderate economic growth yet require a much deeper modernization process. New innovative clusters in Khorezm, Jizzakh, and Karakalpakstan have contributed in diversification, and by the year 2024 the industrial geography has become more balanced.

World Bank report this week found that as for the low-development regions, they are slowly but surely moving, while the medium-level regions are staying at the same 4–6% rate with Tashkent, Navoi and Tashkent City keeping his dominance. Although there is high concentration, regional differences are constantly being reduced.

There is a high degree of differentiation among the regions of Uzbekistan in terms of total industrial output and per capita industrial production.

Group 1 – Technological Centers: Tashkent, Navoi

Group 2 – Balanced Growth Regions: Tashkent Region, Andijan
Group3 - Regions with High Development Potential but Requiring Modernization
Recommendation: Ensuring sustainable growth can be achieved through interregional diversification of industry, the introduction of "digital clusters," and strengthening production infrastructure in Group 3 regions. Table 2

Table 2. Analysis of Indicators Reflecting the Economic Development Status of the Regions of the Republic of Uzbekistan (as of 2024)

Names of Regions:	Unemployment Rate (in %)	Volume of Industrial Output by Regions (at Current Prices; billion UZS)	Per Capita Industrial Output	Number of Active Enterprises and Organizations by Region	Per Capita Total Income
1	2	3	4	5	6
Republic of Uzbekistan	10,5	368 740,2	10771,8	398133	12279,1
Tashkent city	8,0	66 188,0	25052,6	83846	10240,9
Navoi	9,4	65 084,9	64737,5	17067	9427,4
Average Value for Group 1	8,7	65636,4	44895,0	50456,5	9834,1
Tashkent	10,5	65 949,9	22356,3	38523	8940,8
Andijan	10,9	36 376,5	11519,2	30740	20533,2
Average Value for Group 2	10,7	51163,2	16937,75	34631,5	14737
Republic of Karakalpakstan	10,5	13 981,3	7316,1	18404	25999,4
Bukhara	10,6	17 574,4	9080,0	23459	13301,8
Jizzakh	11,0	5 823,8	4170,9	17190	14774,1
Kashkadarya	11,1	14 612,3	4417,4	25259	9503,1
Namangan	10,6	11 011,9	3878,6	25909	12315,8
Samarkand	11,0	18 383,4	4698,6	31354	10931,8
Surkhandarya	11,1	5 322,7	2004,8	19220	10980,7
Syrdarya	11,0	7 990,9	9361,5	13169	10696,6
Fergana	10,9	21 701,2	5732,0	35379	9846,6
Khorezm	10,9	9 615,9	5115,1	18614	11146,3
Average Value for Group 3	10,8	24019,9	8637,9	26468,9	14201,7

Based on Table 2, the analysis of **industrial production volume across the regions of Uzbekistan** is carried out according to three groups. The analysis highlights **differences** among the groups, **the centers of economic gravity**, and regional disparities. **Group 1 (Tashkent City and Navoi)** – highly industrialized regions.This group represents the highest industrial potential in the country.

Average industrial output volume: 65.6 trillion UZS — nearly 3 times higher than the average values of Groups 2 and 3. **Per capita industrial output: 44.9 thousand UZS** — about 4 times higher than the national average (10.8 thousand UZS). **Navoi Region** leads with 64.7 thousand UZS per capita output — the highest indicator in Uzbekistan. **Tashkent City's per capita output** is 25 thousand UZS, functioning as an industrial cluster integrated with the service sector.

Group 1 regions form the "core industrial zone" of the Republic. They are characterized by high technology, strong investment inflows, and high labor productivity.

Group 2 is represented by Tashkent region and moderately industrialized Andijan. Industrial production has relatively high, but their technology is still poorly diversified. Output is averaged 51.2 trillion UZS, or 22% lower than Group 1. Industry output per capita 16.9 thousand UZS 2.6 times lower than Group 1, but twice the level of Group 3 Andijan is a leader in terms of industrial output (36 trillion UZS) and in terms of per capita (20.5 thousand UZS). Tashkent region has a high output in total, albeit low in per capita terms. These areas have a favourable climatic mix as a result of the industrial structure, the development of services and the growing number of innovative enterprises even though production efficiency is still inadequate.

Group 3 includes nine the least industrialized regions. You have a capacity of the industry is in the rear, but the labor force is a lot potential and raw materials. The total industrial output there is 24 trillion UZS, 2.7 times less than Group 1. The per-habitant yield makes up 8.6 thousand UZS, which is five times lower than Group 1. 4–5 thousand UZS – Kashkadarya, Surkhandarya, Namangan; 9–9.3 thousand UZS – Bukhara, Syrdarya. And income here has a really clear difference First, Karakalpakstan earns an average of 25.9 thousand UZS, on the contrary, Fergana makes only 9.8 thousand. These regions require considerable modernization, improved infrastructure, and divided but faster digital transformation. All group differences are summarized in Table 3.

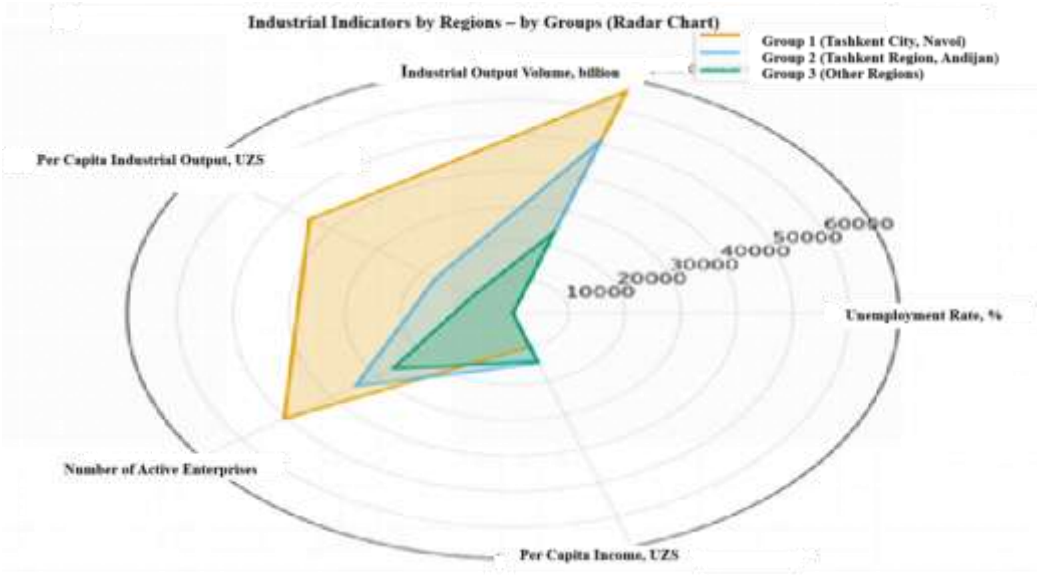
Table 3. High differentiation in industrial production volume and per capita industrial output among the regions of Uzbekistan reflects significant overall interregional disparities.

Indicators	1st group	2nd group	3rd group
Unemployment Rate, %	8,7	10,7	10,8
Industrial Output Volume, billion UZS	65 636,4	51 163,2	24 019,9
Per Capita Industrial Output, UZS	44 895	16 937	8 638
Number of Active Enterprises	50 457	34 631	26 469
Per Capita Income	9 834	14 737	14 202

In Group 1, where the unemployment rate is low, production efficiency is high; whereas in Group 3, despite higher per capita income, the industrial base remains weak. This reflects labor migration, imbalances in production chains, and the concentration of investment flows toward central regions.

According to the data in Table 3, the regions show significant differences in the levels of industrial development and economic activity.

Figure 1. Industrial Indicators Reflecting High Differentiation in Industrial Production Volume and Per Capita Output Across the Regions of Uzbekistan



The primary industrial indicators of regional groups of Uzbekistan by one radar chart are given in Figure 1. As the chart shows: Tashkent city and Navoi First place with improvement both in terms of volume and per capita production Combination of territorial units. Group 2 (Tashkent Region and Andijan) moderate indicators, but higher per capita income Group 3 (rest of the world) featuring lower industrial output, but more balanced region in terms of enterprises and income. Industrial output (65,636.4 billion UZS) and per capita production (44,895 UZS) in Group 1 regions are the highest, which shows that industrial infrastructure is well developed, the labor market is stable, and production is high in these regions. In Group 2, the unemployment rate has risen to 10.7%, yet per capita income (14,737 UZS) remains relatively high. This suggests that income sources are diversified through the service sector and labor migration. Group 3 regions show the lowest results in both industrial output (24,019.9 billion UZS) and number of enterprises, highlighting weak industrial capacity and limited diversification of production sectors. Overall, Group 1 represents the industrial leaders, Group 2 the transitional regions, and Group 3 the areas in need of economic incentives and investment, see Figure 1.

4. Conclusion

Ensuring sustainable growth of regional economies comes down to two key factors — analysis of the industrial structure. Thus, keeping a structural balance of economic branches between them, increasing the production of non-resource-intensive goods with high added value similar to state-of-art technologies all of these work greatly towards strengthening the competitiveness of a region. In addition, industrial diversification, logistics infrastructure development and investment attractiveness in the regions create conditions for formation of new production facilities based on market demand. The consolidation of production chains from clustering allows to use economic resources optimally and also operates the resources for export. A detailed quantitative and qualitative analysis of industrial structure makes it possible to formulate certain strategic directions for enhancing the efficiency of regional industrial policy, strengthen economic security, and create conditions for sustainable industrial development in the regions of Uzbekistan. Based on these facts, regional economic development policy ranks industrial structure improvement in the top priorities of its API.

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