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# THE ROLE OF INNOVATION IN ECONOMY STRENGTHENING OF AZERBAIJAN IN THE CONDITIONS OF TRANSITION TO INDUSTRY 5.0: ON THE EXAMPLE OF A COMPARATIVE ANALYSIS OF INDICATORS OF SOME EURASIAN COUNTRIES

*The object of the study is innovative transformations in the context of Azerbaijan's transition to Industry 5.0. Innovative development not only strengthens the national economy, but also creates preconditions for the entry of competitive industrial products and services into world markets in the context of the transition to Industry 5.0. Innovative transformations are possible only with investments from both the state and industrial enterprises' own funds, as well as by attracting foreign capital. In this regard, the article examines the indicators of both Azerbaijan innovative development and Azerbaijan investment indicators in comparison with similar indicators of a number of Eurasian countries in the context of the transition to Industry 5.0.*

*The authors used both innovation development indices and statistical indicators of industry in other Eurasian countries to determine Azerbaijan's innovation capabilities in the context of the transition to Industry 5.0. The article also examines internal and external factors influencing innovation development in Azerbaijan and investment attractiveness in the republic. The study showed that large innovation and investment projects in the liberated lands attract foreign investors from both near and far abroad. Particularly noteworthy are investments from the Organization of Turkic Countries (OTC) – from Turkey, Kazakhstan, Uzbekistan, Kyrgyzstan. They are actively involved in the creation of smart cities, industrial facilities, transport infrastructure and telecommunications, as well as tourist facilities. Innovative development of Azerbaijan depends on the strategy of implementation of innovative investment projects. This strategy includes improvement of produced science-intensive products and services; and development of high technologies, especially information technologies. These areas include the creation and management of two artificial satellites of Azerbaijan, the petrochemical industry, the mechanical engineering industry. As well as the information technology sector, the ICT sector, pharmaceuticals and cosmetics industry based on the use of unique plants (saffron, medicinal oils from walnuts, hazelnuts, juices from unripe grapes, fig leaves) in the process of transition to Industry 5.0.*

**Keywords:** innovative transformations, innovative investment projects, Eurasian countries, Azerbaijan innovative development, transition to Industry 5.0.

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## 1. Introduction

The priorities of the new economy are new technological sectors. The new technological structure not only helps to meet growing needs, but also ensures the transition of quantity into a new quality in the conditions of transition to Industry 5.0. Solving the problems of innovation is the most important task for real growth and development, the main factor in modernizing

the economy, contributing to the transition from quantitative growth to qualitative growth in a rapidly changing economy.

The key research questions of study are:

- Do innovative transformations influence the economy strengthening in the conditions of transition to Industry 5.0?
- Has the innovative potential of Azerbaijan changed and what successes have been achieved in the conditions of transition to Industry 5.0?

- How did innovative transformations and foreign investments affect the Azerbaijan national economy in the conditions of transition to Industry 5.0?

It is important to know *who*, *why* and *for what purpose* will carry out innovative development. For progressive development it is advisable to develop the economy real sector by using innovation and investment potential in order to ensure sustainability and reduce dependence on world market conditions in the conditions of transition to Industry 5.0.

The lack of development of the innovation sector is the low demand for innovative products and services from the state and business. By increasing the ratio of R&D to GDP, real progress can be achieved in high-tech industries.

Industry 5.0 is based on technological and business principles, in contrast to Industry 4.0, which is focused on three principles: people-centeredness, sustainability and sustainable development. This is the era of smart machines, when information exchange and control can be done without human intervention thanks to the industrial Internet. It should be noted that in the end, any industry involves the creation of the foundations of the industrial revolution in the production process. If you remember, Industry 1.0 created the conditions for the transition to new production processes using water and steam.

Industry 2.0 can be called a "technological revolution" as new technological systems have been introduced. Industry 3.0 is the first computers, that is, the use of electronics and information technology to implement further automation, Internet accessibility, communications and renewable energy sources. Industry 4.0 uses robots, information technologies and artificial intelligence. Nowadays, the process of transforming factories into intelligent enterprises is underway with the aim of concentrating human hands and minds into an industrial structure, that is, man and machine combine their actions in order to improve the use of means of production and increase production efficiency. All this is a consequence of increasing uncertainty and the complexity of the process of adapting to changing conditions, increasing the impact of environmental problems, which requires the support of smarter, cleaner and more sustainable industries.

According to [1], Industry 5.0 creates the foundations of digitalization, where "digital maturity is the ability to quickly respond to or take advantage of market opportunities based on current technology stacks, human resources and digital technologies. It is the ability of an organization to achieve digital transformation, not just from a digital perspective, but across the entire organization, including people, culture and processes, to achieve business results without the risk of human error. While there is a strong focus on technology, an organization's digital maturity level is also impacted by speed and adaptability, thanks in large part to human capital resources and automated processes. This is teamwork in the truest sense of the word... The Industry 5.0 business model will rely heavily on the education and training of manufacturing workers so that they can optimize their HR skills and find their place in this modern business model... will enable real "mass personalization" and more flexible production". Everything is ultimately done to achieve socio-ecological sustainability.

Because, "The core strategy of Industry 5.0 aims to provide a framework for industry that combines competitiveness and sustainability, enabling industry to realize its potential as one of the pillars of transformation. It is a strategy aimed at highlighting the impact of alternative modes of (tech-

nological) management on sustainability and resilience. An effective Industry 5.0 strategy empowers digital workers by supporting a human-centric approach to technology; paves the way for transition to environmentally sustainable use of technologies; expands the corporation's responsibilities throughout its value chain; and finally, indicators are introduced that show, for each industrial ecosystem, the progress made towards well-being, sustainability and overall sustainability" [1].

If Industry 4.0 uses robots, BIG DATA and artificial intelligence in industrial production, then Industry 5.0 creates favorable conditions for enhancing the creative potential of a person who will control robots and cobots, plan their work and set tasks that must be performed taking into account the optimization of industrial production [2]. The integration of robots into production will create a true collaboration between man and robot, between human consciousness and Artificial Intelligence (AI). An important component of Industry 5.0 is the human-machine interface [3]. Robots will learn from people creative thinking, performing tasks with many unaccounted factors, and people will be able to benefit from the activities of robots by solving their psychological problems (monotony of operations, physical stress in industrial production, which are a burden for people), and health (avoiding an unfavorable environment) [4].

Positive effects from Industry 5.0 are expected. But for this it is necessary to rebuild the system not only of maintenance and repair, but also of production assets. Industry 5.0 is also people-oriented and places human needs at the center of the production process, but also retains the talent in production necessary to compete.

The authors came to the conclusion that not all components of Industry 5.0 correspond to high results. And, therefore, *the aim of this research* is to study not only the industrial potential of knowledge-intensive industries, but also the socio-economic conditions of innovative transformations and issues of financing innovative investment projects in Azerbaijan in comparison with data from a number of Eurasian countries that were the main partners of Azerbaijan in the USSR and, therefore, are interconnected with each other economically.

The scientific part of the study includes the solution of the following problem: Do Azerbaijan and its economic partners in the near abroad have the ability to quickly transition to Industry 5.0? What external and internal factors influence the rational transition to Industry 5.0.

The practical part of this study will allow to assess the place of innovative transformations and investment attractiveness of Azerbaijan at the present stage and identify shortcomings in this area. Identification of internal and external factors of innovative development and technological factors contributes to the elimination of shortcomings and a successful transition to Industry 5.0.

## 2. Materials and Methods

This article investigates the possibilities of innovative transformations, the export potential of high-tech and knowledge-intensive products, as well as comparative indices of innovative transformations in the national economies of some Eurasian countries in the conditions of transition to Industry 5.0 in recent years. The units of measurement were US dollars, the share in the structure of articles in %, a quantitative expression of the place of countries

in the world ranking. Here were used the macroeconomic statistics from Azerbaijan, indicators from websites of some Eurasian countries (former USSR countries), data from *TheGlobalEconomy.com*, *trademap.org* and other websites of the world economic community.

For solve the key research questions were used:

- literature review in sphere of innovations in transfer to Industry 5.0;
- statistical data grouping of innovative transformations' indicators of Azerbaijan which influence the economy strengthening in transition to Industry 5.0;
- SWOT and PEST analysis for evaluation of Azerbaijan innovative potential changing in process to transition to Industry 5.0;
- analysis of innovative transformations and foreign investments affect to Azerbaijan national economy in the conditions of transition to Industry 5.0.

The authors analyzed data on innovative transformations of Azerbaijan using a comparative analysis of data from former USSR countries. The article also assessed innovation and investment activities using expert assessment of external and internal factors by PEST, SWOT analyses.

### 3. Results and Discussion

#### 3.1. The role of innovation in transfer to Industry 5.0: methodological approach

Innovation, being the main factor of high-quality economic growth, influences to GDP dynamics and technological potential of country [5]. Innovative technologies, financing of innovations is the integral part of any system functioning.

Azerbaijan has intellectual potential, but the country is not a supplier of innovative technologies to the domestic market, in the conditions of transition to Industry 5.0. Suppliers of innovative technologies are foreign innovative systems, software, updates, servers and other innovative technological products and services [6]:

- the state itself must be the manufacturer and main supplier for the introduction of innovative technologies in the country. All software products must be produced, supplied and serviced only by government's own proprietary enterprises;
- a special system and control of data transmission over networks is required (encryption and encoding in parts, and then combining them into a single whole);
- the implementation of innovative systems requires a certain level of training of qualified personnel, but to simplify this process it is advisable to use the simplest interface model. Also, before introducing innovative technologies, it is important to test them qualitatively for their correct technical functioning;
- the decision-making system on the part of the state and the system itself for the development and implementation of innovative technologies in government sectors must be flexible.

As representatives of the neoclassical school note, at the moment, the influence of industrial production on strengthening the national economy is gradually receding into the background; priority of influence is now given to the financial sector and service sectors. It is possible to note the fact that it is the manufacturing sector that has always been at the forefront of introducing technological and organizational capabilities into the national economy. It is the increase in production potential that is still crucial in solving existing problems [7].

Let's consider external factors influencing the introduction of innovations into Azerbaijan national economy by PEST analysis (Table 1).

**Table 1**

PEST analysis of innovation changings in Azerbaijan national economy in transfer to Industry 5.0

Positive aspects	Negative aspects
<b>Political factors</b>	
– Political stability contributes to the creation of large industrial facilities in the liberated lands. – A modern and efficient railway transport route is being created from East to West, also from North to South for efficient freight flows	– Neighboring states are not always interested in innovations in various sectors of the economy – in the field of ICT and space exploration, in the development of road and railway communications, in the creation of smart cities in the liberated territories
<b>Economic factors</b>	
– Azerbaijan has rebuilt the structure of its national economy through foreign investment and, in the last 10 years, through its own sources of financing. – Azerbaijan uses preferential customs taxation for certain types of scientific and technical products. – Azerbaijan develops large and medium-sized businesses, especially in the field of metalworking, automotive, and household instrument making	– Azerbaijan invests in many different innovative projects in various sectors of national economy at the same time. – Innovative transformations are imitative in nature and are characterized by investment attractiveness for receiving early dividends
<b>Social factors</b>	
– Azerbaijan spends investments on education of youth abroad and on retraining of young specialists	– There is an imbalance between highly qualified specialists and opportunities to provide them with work
<b>Technological factors</b>	
– The share of service turnover in ICT sector is equal 14 % in the world. – Azerbaijan is updating equipment and software in the telecommunications sector in order to provide a competitive economic infrastructure – e-banking, e-trading, e-commerce and etc.	– The introduced innovations cover only the ICT sector or robotic industrial enterprises. – Not only radical, but also improving innovations are not observed in knowledge-intensive sectors of the economy – mechanical engineering, production of special vehicles, shipbuilding

The important question is: *Does the economy give birth to innovation? or Does innovation give birth to the economy?* Innovations create a new technology. A new technology used to production producing for strengthening economy. The interaction of different parts of science contributes to the formation of an environment for the emergence of a new economy, new forms of society and economy. Innovation generates the economy [8].

The authors note that Azerbaijan government bodies that control the domestic products' export should be directly involved in promoting goods to the foreign market, i. e. resolve not only legal and financial issues, but marketing research and advertising activities in industrial production of products that meet international standards [6]. And these events significantly improve the export potential of high-tech products and services.

#### 3.2. Innovation changings' influence to national economy strengthening in transfer to Industry 5.0

The R&D indicator indicates progress in high-tech industries not only in industry, but throughout the economy. The ratio of expenditures on research and development to GDP and budget revenues from the use of intellectual property reflect the dynamics of scientific research (Table 2).

**Table 2**

R&D/GDP (% and place in the ranking) and R&D (billion person and million USD)

Countries, %/place	R&D/GDP (%)		Researchers in R&D (billion person)		Budget revenues from intellectual property using (balance of payments, current million USD)		
	2015	2020	2019	2020	2015	2020	2021
Azerbaijan	0.22/77	0.22/56	1718.8	1734.9	–	–	–
Georgia	0.30/69	0.30/49	–	–	0.6	1.0	6.14
Kazakhstan	0.17/80	0.13/63	636.93	689.3	0.9	1.4	2.9
Kyrgyzstan	0.12/87	0.09/65	–	–	1.4	1.4	1.94
Latvia	0.62/48	0.71/39	1904.82	2158.84	6.6	8.03	11.8
Lithuania	1.04/35	1.16/29	3489.6	3728.5	22.9	8.4	11.1
Moldova	0.31/71	0.23/55	836.3	788.6	4.5	1.8	2.9
Tajikistan	0.11/91	0.09/66	–	–	–	0.02	–
Uzbekistan	0.17/81	0.14/62	417.998	423.94	1.01	0.15	0.23
Ukraine	0.61/52	0.41/46	880.6	846.25	85.0	74.0	69.0
Estonia	1.47/23	1.79/18	3767.97	3846.12	11.9	20.6	36.8

**Note:** the table is based on [9–14]

As can be seen from Table 2, Azerbaijan research expenditures moved from 77 in 2015 position to 56 position in 2020, Georgia – from 69 to 49 positions, Kazakhstan – from 80 to 63 positions, Latvia – from 48 to 39 positions, Lithuania – from 35 to 29 positions, Moldova – from 71 to 55 positions, Tajikistan – from 91 to 66 positions, Uzbekistan – from 81 to 62 positions, Ukraine – from 52 to 46 positions and Estonia – from 23 to 18 positions respectively.

The number of people involved in R&D is growing. But it should be noted that fees of intellectual property using, revenues to balance of payments were significant in Estonia, Latvia and Lithuania, but this data is not available for Azerbaijan. There is growth in Azerbaijan quantitatively, but the qualitative effect from both people and invested funds is important.

The data in Table 3 indicates a low level of intensity and industrialization index in Azerbaijan (0.17 in 2021). True, in 2021 compared to 2015 data, the situation improved by 0.03, but the indicator still remained low (0.17). High values of this indicator are observed in Lithuania (0.43), Estonia (0.36), Uzbekistan (0.41), Moldova (0.27) and Kazakhstan (0.24). An improvement in the indicator over 6 years is observed in Tajikistan (+0.11), Azerbaijan (+0.03), Latvia (+0.03) and Lithuania (+0.03), which associated with the construction of industrial facilities in these countries. It is important to improve quality characteristics to achieve sustainability in the economic development of the country.

It is also important to improve quality characteristics to achieve sustainability in country's economic development to transfer Industry 5.0. It is advisable to improve the quality component, which gives real results together with the ongoing activities. The measures taken by Azerbaijan Government to create new infrastructure in liberated lands influenced not only the industrial construction of new production facilities, but also contributed to an increase in the index of sustainability, efficiency, innovation and attractiveness in the country.

**Table 3**

Intensity and industrialization index for 2015–2021

Countries	Years					Increase (+) or decrease (–) for 2015–2021
	2015	2017	2019	2020	2021	
Azerbaijan	0.14	0.14	0.15	0.17	0.17	+0.03
Georgia	0.22	0.21	0.20	0.20	0.19	–0.03
Kazakhstan	0.24	0.24	0.26	0.25	0.24	0–neutral
Kyrgyzstan	0.21	0.23	0.24	0.22	0.20	–0.01
Latvia	0.27	0.28	0.29	0.31	0.30	+0.03
Lithuania	0.40	0.41	0.42	0.42	0.43	+0.03
Moldova	0.27	0.29	0.32	0.31	0.27	0–neutral
Tajikistan	0.15	0.22	0.25	0.27	0.26	+0.11
Uzbekistan	0.30	0.33	0.34	0.30	0.29	–0.01
Ukraine	0.37	0.35	0.37	0.32	0.31	–0.06
Estonia	0.37	0.38	0.40	0.35	0.36	–0.01

**Note:** the table is based on [15–17]

Let's consider the 1st State Program "Great return to the liberated territories of Azerbaijan". The most important direction of this five-year program is the implementation of the concepts of "Smart City" and "Smart Village", "Green energy zone". The Government of Azerbaijan is carrying out a lot of work in this direction and the restoration of occupied lands is a good example. Thus, in order to realize the industrial potential of region, reintegrate into the country's economy and provide employment, industrial zones were created in Aghdam city, Jabrayil district, and the Araz Valley economic zone. The liberated territories will be a priority zone of "Green energy", that is, not only the revival of land, but also the implementation of modern development concepts "Smart City" and "Smart Village" [7].

Azerbaijan government create the most convenient opportunities in the liberated territories for those who have been deprived of their land for 30 years. Republic both the political will and financial resources to restore these territories, and it is possible to do it [2].

Their creation will contribute to more cost-effectively accelerating the achievement of sustainable development in remote areas through the use of an integrated technology



development platform model. The security and efficiency of the public service system also increases, coupled with reduced costs, coordination, increased transparency, etc. The digital transformation of rural areas ensures not only growth and development, but also a reduction in migration from regions to cities. Alternative energy sources will be provided to homes, social facilities, industrial and agricultural facilities.

According to the efficiency index in 2021, Azerbaijan is at the level of Baltic countries (Table 4).

**Table 4**

Indices of innovativeness, sustainability, attractiveness and efficiency in some Eurasian countries (former USSR countries) for 2021

Countries	2021			
	Innovative-ness Index	Sustainability Index	Global Attractiveness Index	Efficiency index
Azerbaijan	37	39.0	36.7	61.9
Georgia	36	54.0	32.8	53.0
Kazakhstan	37	45.2	40.4	54.2
Kyrgyzstan	19	50.9	23.5	43.1
Latvia	35	48.9	42.3	55.2
Lithuania	38	45.2	40.0	54.7
Moldova	21	46.8	20.1	42.7
Tajikistan	1	45.0	13.9	47.1
Uzbekistan	28	26.4	32.2	39.9
Ukraine	45	31.5	28.4	40.2
Estonia	45	55.4	54.5	69.3

**Note:** the table is based on [18]

As can be seen from Table 4 Azerbaijan's innovation index is equal to 37 in 2021, sustainability index – 39.0, attractiveness index 36.7. All of indices of Azerbaijan are at a low level, but the efficiency index (61.9) is higher than all countries of former USSR, except Estonia (69.3). The most stable indicators on the index of innovation, sustainability, attractiveness and efficiency are observed in Estonia, Kazakhstan, Georgia, Lithuania and Latvia.

Correctly implemented macroeconomic policy helps to increase the innovation component in country's economic structure for transfer to Industry 5.0. This creates the basis for sustainability in country's economy development in transition to Industry 5.0. At the same time, let's look at research expenditures per capita (Table 5).

Azerbaijan (% of total government expenditures) increased in 2022 (13.0 %) compared to 2015 (7.63 %). For comparison in 2021 the public sector expenditures on education was equal to 11.48 %. As evidenced by the data in Table 5, there is a positive trend in expenditures aimed at education. Government spending on education also increased (total % of GDP) from 2.95 % in 2015 to 4.71 % in 2021. It is important to note that it is possible to increase spending on education, but without changing its organizational component, these expenses will not be effective. For example, in Azerbaijan there is an increase in government spending on education, but so far, the effectiveness is low.

In Georgia, there is a slight change: from 11.12 % in 2015 up to 11.2 % in 2021 and its percentage in GDP in 2021 amounted to 3.62 %. In Kazakhstan, government spending on education increased from 12.19 % in 2015 to 18.6 % in 2020 and its percentage in GDP in 2020 amounted to 4.45 %. And in 2021 in Kazakhstan, govern-

ment spending on education increased further and was equal to 14.1 % (decrease in compare with 2020 indicator about 4.5 %). In Kyrgyzstan this indicator increased from 15.75 % in 2015 to 16.5 % in 2021 and its percentage in GDP amounted to 6.22 % in 2020. In Latvia, government spending on education has decreased from 14.13 % in 2015 up to 11.1 % in 2021 (about 3.03 %) and its percentage in GDP amounted to 5.97 % in 2020.

**Table 5**

Research expenditures per capital

Countries	Public sector expenditure on education, %			Government spending on education, % of GDP		
	2015	2020	2021	2015	2020	2021
Azerbaijan	7.63	10.50	11.48	2.95	4.33	4.71
Georgia	11.12	11.17	11.2	3.17	3.85	3.62
Kazakhstan	12.19	18.60	14.1	2.79	4.45	–
Kyrgyzstan	15.72	20.69	16.5	5.99	6.22	–
Latvia	14.13	13.76	11.1	5.28	5.97	–
Lithuania	12.29	12.03	11.7	4.23	–	–
Moldova	18.18	17.99	18.0	5.81	6.39	–
Tajikistan	16.39	17.77	19.91	4.97	5.92	–
Turkmenistan	–	–	28.0	–	–	–
Uzbekistan	22.37	20.54	20.05	5.49	4.92	–
Ukraine	13.34	13.09	13.1	5.74	5.38	–
Estonia	13.0	14.4	13.4	5.14	6.58	–

**Note:** the table is based on [12, 14]

The situation is similar in Lithuania: it is possible to observe a decrease from 12.29 % in 2015 up to 11.7 % in 2021 (about 1.22 %) and its percentage in GDP amounted to 3.97 % in 2019. Government spending on education diminished from 18.18 % in 2015 up to 18.0 % in 2021 in Moldova and its percentage in GDP amounted to 6.39 % in 2020. In Russia this indicator decreased from 10.87 % in 2015 up to 14.3 % in 2021. Tajikistan has seen an increase of 16.39 % in 2015 up to 19.91 % in 2021 and its percentage in GDP amounted to 5.92 % in 2020.

In Turkmenistan observed the growth from 23.01 % in 2019 up to 28.0 % in 2021. But in Uzbekistan indicator of Government spending on education decreased from 22.37 % in 2015 up to 20.5 % in 2021 and its percentage in 2020 amounted to 4.92 %. Ukraine demonstrates the decrease of this indicator from 13.34 % in 2015 up to 13.1 % in 2021 and its percentage in GDP was equal to 5.38 % in 2020. In Estonia has got the minimal change from 13.0 % in 2015 up to 13.4 % in 2021 and its percentage in GDP amounted to 6.58 % in 2020. The data confirm the feasibility of carrying out real activities to improve the current situation in order to achieve qualitative changes.

If to look at the economic potential of the former USSR states, it is possible to see that Ukraine and Kazakhstan have high competitiveness indices when comparing different innovation indices. Azerbaijan's position in the economy and application of innovations remains at an average level, but there is an opportunity to rise to a higher level.

When to look at the GDP indicators of Azerbaijan, it is possible to see that Azerbaijan's spending on science is around 2 % (Table 6) and therefore belongs to upper middle-income countries. According to this indicator, Azerbaijan's position was variable during the pandemic, and

in 2023 compared to 2020, it even worsened by 1 point. The dynamics of the GDP indicator also decreased compared to 2020–2023 (it fell by 7 points). Due to its innovation potential, Azerbaijan's position among Asian countries declined and returned to its position in 2023 [15, 19–23]. According to the results of innovation, the republic's place among Asian countries has worsened by 18 points (Table 6).

**Table 6**

The dynamics of Azerbaijan's Global Innovation Index during 2020–2023

Years	GII ranking among countries	Place among countries in terms of innovation potential	Place among countries according to innovation results	Place among upper-middle income countries
2020	82	76	86	27
2021	80	79	91	24
2022	93	74	110	32
2023	89	76	104	28

**Note:** the table is based on [15, 19–24]

Azerbaijan's domestic industrial diversification was equal to the index coefficient of 0.201 in 2020, increased by 3.83 % compared to the previous year, and equaled to the index rate of 68 in 2023. In 2023, high-tech production was equal to 12.32 % of the total production in 2020 and increased by 0.93 %. Within a year, the indicator moved to 85th place [15, 19–23]. Azerbaijan's position among upper-middle income countries was 28 in 2023 (its position in 2022 was 32). The complexity of production and export had a coefficient of –1.242 in 2020, increased by 1.045 % compared to the previous year and took the 114th position [14]. High-tech exports were equal to 22.2 million USD in 2021, a decrease of 34.5 % compared to the previous year and moved to the equivalent 118th place. The creation of mobile applications equaled 36,338.64 billion USD/GDP, increased by 533.9 % compared to 2022 and occupied 97th place [15, 19–23].

Radiophysics, laser technology, electronics, optoelectronics, chemistry and catalysis, cosmonautics, a number of new technologies and inventions are science-based products or science-based technologies [25].

Today Azerbaijan is represented by more than 100 types of science-intensive and innovative products and services in the field of construction engineering; metal processing and detection of defects; in the field of purification and regeneration of liquids, oils, fuels; in the field of installation and repair of construction equipment; in the field of providing construction equipment services; in the field of electrical engineering; in the field of shipbuilding; in the automotive industry and etc. Among them are the following [25]:

- device for laser scanning of objects – products of the company "Laser Gulf";

- rent, rental of equipment for telecommunications, development of projects of telecommunication systems of the campaign – products and services of the campaigns "Fuadakva, JV", "Granit, AS Company"; "Criogen, JV", "Altun Temel, JV", "4Comfort, JV", "ABC Consulting, JV";
- production of auto parts by subcontracting from "AST-M-Trans";
- manufacture of parts and units of general engineering from "AST-M-Trans";
- SKD and SKD car assembly from "Berlin Wasser";
- exploration works – service of "Kangarli, JV" campaign;
- production of models of industrial and residential buildings – products and services of the campaign "M Studio".

Let's consider the data on investments, on technological costs and on profits in the industry of Azerbaijan for 2017–2022 (Table 7).

As can be seen from Table 7, the pandemic has affected the economic performance of Azerbaijan's industry. For 4 years the indicators on investments (–14.5 %), on profit (–18.0 %), on net profit (–21.0 %) worsened [26]. But the cost of technological innovation has increased by about 2 times [27].

As can be seen from Table 8, expenditures of technological innovation shows that a significant part falls on the manufacturing industry, including the metallurgy, engineering, and food industries (Table 8).

As can be seen from Table 8, the technological innovations mainly cover product innovations. But recently the innovations have increased in metallurgy and mechanical engineering, which update technological lines. Metallurgy and mechanical engineering enterprises are modernizing their production and introducing up-to-date automated lines [26].

In recent years the domestic enterprises have mainly used the internal sources of financing for innovation. Capital investments in all branches of machinery are spasmodic in nature. Machinery is dominated by an extensive, labor-intensive method and a territorial-production orientation of expanding production. Expect of enterprises in the oil and petrochemical industries, of industrial park in the city of Mingachevir [28] and of Sumgayit Technological Park [29] many republic enterprises are developing in a territorial-production way of expanding production, which most of all corresponds to the extensive type of industrial development.

Table 9 shows what have no analogues in the world and what have been improved [26]. Creation of knowledge-intensive products has got a spasmodic nature and depends on investments.

The fourth Programme of socio-economic development of Azerbaijan regions (2019–2023) suggests taking this circumstance into account and creating industrial and agricultural processing enterprises, taking into account innovative transformations [28].

**Table 7**

Investments, technological innovations' expenditures and profits in Azerbaijan industry (million AZN)

Indicators	2010	2015	2020	2022	In 2022 to 2010, in %
Investments	4276.0	2015.0	24732.6	68434.7	App. 16 times
Total profit	20743.0	15803.0	20875.2	63681.8	307.0
Net profit	20008.0	14318.0	18280.8	61154.5	305.6
Expenditures to technological innovations	8139.0	35179.1	35919.8	22540.4	276.9

**Note:** the table is based on [26, 27]

Table 8

Expenditures to technological innovations in industry by types  
of innovations (thousand AZN)

Indicators	2010	2015	2020	2022	In 2022 to 2010, in %
All industry	8139.0	35179.1	35919.8	22540.4	276.9
– product innovations	7951.7	13685.2	20059.2	18154.3	228.3
– process innovations	187.3	21493.9	15860.6	4386.1	23 times
Manufacturing	8128.5	32492.5	34918.7	22521.1	277.0
– product innovations	7941.2	11157.2	19421.0	18135.0	228.4
– process innovations	187.3	21335.3	15497.7	4386.1	23 times
Food industry	690.6	–	8667.0	195.1	28.2
– product innovations	690.6	–	8667.0	129.9	18.8
Beverages' industry	1051.8*	12792.0	–	1754.0	351.2
– product innovations	499.4*	–	–	1754.0	351.2
– process innovations	552.4*	12792.0	–	–	–
Chemical industry	177.6	199.5	–	16010.1	90 times
– product innovations	–	144.6	–	16010.1	–
– process innovations	177.6	54.9	–	–	–
Basic metals' industry	–	–	12479.2	–	–
– product innovations	–	–	3983.2	–	–
– process innovations	–	–	8496.0	–	–
Machinery	0.7	15871.2	9500.0	124.5	177 times
– product innovations	0.7	10608.7	3000.0	1.5	–
– process innovations	–	5262.5	6500.0	123.0	–

Note: \* data of 2009; the table is based on [26]

Table 9

Knowledge-intensive products in Azerbaijan industry, million AZN

Industry	Production which has undergone to significant changes or again restored			Improved products		
	2010	2020	2022	2010	2020	2022
All industry	4.4	11.7	72.8	2.0	16.8	38.6
Manufacturing	4.4	9.3	68.8	2.0	16.8	38.6
Manufacture of computer and electronic equipment	0.2*	4.7	0.5	0.05*	–	–
Manufacture of machinery	1.2	0.04	–	0.1**	–	–

Note: \* data of 2009, \*\* data of 2011; the table is based on [27]

Only small percentage of industrial enterprises are developing and implementing the technological innovations (Tables 8, 9). The share of science-intensive products in the world trade volume does not exceed 0.3–0.5 %. At the same time Azerbaijan innovative products do not reach 1 %. The level of economic development does not yet meet modern development requirements. But now more Azerbaijan manufacturing enterprises improve their technological lines, renew their equipment. The ongoing activities indicate that the innovative development path is the result of institutional, economic, social innovations.

The main problems of the country's innovative development are the following:

- lagging behind developed countries. A small percentage of industrial enterprises (mostly enterprises in military industry, oil and gas production, space research)

are engaged in the development and implementation of technical and technological innovations;  
– innovative products do not reach 1 % of the global trade in science-intensive products;

- R&D expenditures constitute a small percentage of GDP;
  - low potential of applied and fundamental sciences, which determine the sources of economic development.
- In the "scientific organizations-innovation" chain, the biggest problem of science is probably not the low level of funding, but its lack of demand.

Over the past decade Azerbaijan has built a number of enterprises in the agricultural sector for the industrial production of dairy products and winemaking by European partners, and has also modernized the industrial enterprises – in metallurgy, in engineering and in the railway sector by foreign investment from developed countries. Innovations in industry, in infrastructure of Azerbaijan economy contribute to development of national economy.

### 3.3. Financing of innovation projects: reality and expectation

Another important point is the transformation process. This process includes at least 9 levels of technological readiness of project from scientific idea into market product realize. Of these, 4–7 levels are occupied by engineering in various qualifications. Most technologies die at this stage. The destruction of the "Academic institute – Engineering center – Enterprise" link creates serious problems and requires the construction of new mechanisms in period to transfer to Industry 5.0.

If to turn to the experience of developed countries, it is possible to see the private sector active part in financing applied sciences. In contrast Azerbaijan fundamental research like as fundamental research in former USSR countries is financed mainly from state budget. It is also important to improve quality characteristics to achieve sustainability in the country's economic development in transfer to Industry 5.0. It is advisable to improve the quality component, which gives real results together with the ongoing activities. The measures taken by Azerbaijan Government to create new infrastructure in the liberated lands influenced not only the industrial construction of new production facilities, but also contributed to an increase in the index of sustainability, efficiency, innovativeness and attractiveness in republic.

12 billion manats were allocated from the state budget for the implementation of projects under the 1st State Program since 2021. For example, in Zangelan district of Azerbaijan, work is being carried out to develop Smart infrastructure, a high-tech agricultural complex. Here are being installed the communal IT infrastructure, solar panels, equipment for biogas production, and installations for generating "green" energy. To improve the management of production clusters is being created the computerized irrigation management system. Drones are being used to monitor crops, pollinate crops, a poultry management system. Here are being created the analytical centers.

Conditions have been created to attract investment and develop business activities. Thus, 310.4 billion USD were allocated in Azerbaijan economy for the period 2003–2022. 154.1 billion USD of these are foreign investments. For comparison: in 2002 was allocated to the economy about 2.8 billion USD, in 2022 – 17.1 billion USD. Volume of foreign direct investment for the period 2003–2022 amounted to 100.7 billion USD [30].

The country is holding many events to develop innovative entrepreneurship, for which elements of the knowledge economy. In result, the 4th industrial revolution is used in republic. Azerbaijan now in transition process to Industry 5.0. Azerbaijan industry use to form the creative directions of digitalization in the different technologies, the creation of "Smart City" and "Smart Village", "Green zone" energy projects in Karabakh zone [31]. All this will help create the foundations of a sustainable economy and solve socio-economic problems in transition to Industry 5.0.

Azerbaijan itself must be the manufacturer and main supplier for the introduction of innovative technologies in republic. All software products must be produced, supplied and serviced only by the government's own proprietary enterprises in transfer process to Industry 5.0.

However, Azerbaijan "business representatives are interested in short – term projects that guarantee enterprise income and less risk" [32]:

- the results of science are little used;
- in the adopted concepts, programs, strategies, Road Map there is no precise definition of *"who is the subject"* of innovative development, the role of the state apparatus in the implementation of directions of innovative development, existing personnel problems;
- at the basis of innovative development there are not breakthrough, but inertial components. It is easier to procure than to finance radical or basic innovations.

Foreign investments in the field of engineering structures' restoration, reconstruction of destroyed cities, especially in the newly liberated territories of Azerbaijan (creation of an airport in Fuzuli city, roads, railways, creation of telecommunications structures, smart cities and etc.) also actively influence to Azerbaijan economy strengthening. Despite changes in the innovative potential of Azerbaijan and their positive impact on the economy of Azerbaijan, there are a number of shortcomings in the field of organizational nature. These include, mainly, the insufficient development of entrepreneurial activity in the field of R&D.

Currently there is a transitional innovation system in place, which needs to be improved by managing the innovation market based on government orders. Large research does not automatically translate into revolutionary technology in transition to Industry 5.0: it requires money, time and patience – three things that are in great short supply these days.

As is seen, economic development is a process of economic growth based on the growth of production capacity in the country, that is, the ability to transform its production activities. Results of investigation demonstrate next:

- it should be noted that there are almost no global science and research companies in the territory of Azerbaijan. It would be good if such companies operate not only in strategic facilities, but also in non-oil sectors of the national economy. There is a need to establish such companies in non-oil sectors by the state;
- foreign-financed projects on the creation of innovation-based science-intensive products and distribution of services have a small weight in Azerbaijan's GDP. This, in turn, makes it difficult for it to introduce innovations on its own with little money;
- paying attention to the sale of products and services in the fields of online trade and education, healthcare, social protection, as well as offering online services for

government agencies (especially during a pandemic) is one of the important conditions for increasing the speed of the Internet and solving security issues;

- the safety of consumers and the responsibility of parties and intermediaries in purchases made through e-commerce mediation should be taken into account in the legislative regulations;

1) measures should be taken to protect intellectual property rights;

2) taxation, payment and delivery methods need to be developed;

3) it is necessary to take measures to protect consumers and their personal information;

- paying attention to making the information understandable, enjoyable and entertaining in the website space where electronic commerce operations take place can increase the number of visitors and increase the turnover of the website;

– the application of the tax system applied to the field of e-commerce is sometimes dual in nature, and it is necessary and urgent to form a system for calculating the tax levy in the banking system, not according to the goods, but according to the service. The state can also organize incentive campaigns and concession mechanisms for the development of this area.

The existing low production capabilities and the extraction of natural resources, coupled with cheap labor, do not create a solid and real basis for real economic growth and development. Naturally, technical, technological either organizational and managerial changes underlie economic growth and development for transfer to Industry 5.0. The emerging innovations are important in setting technological priorities in those industries where it is combined with a quality component.

#### **3.4. SWOT analysis of Azerbaijan export potential changings in transfer process to Industry 5.0**

According to the data in Table 4, Azerbaijan's innovation indices are close to those of Georgia, Kazakhstan, Uzbekistan, Latvia and Lithuania. Azerbaijan's attractiveness index is close to the corresponding index of Georgia and Uzbekistan. But Azerbaijan's efficiency index is higher than the average and close to Estonia's efficiency index. And this achievement is connected with the use of Azerbaijan's ICT satellite services export for users in the Southern Hemisphere. Therefore, Azerbaijan's experience can be applied in Uzbekistan and Georgia. But these countries need to actively attract foreign investment to renew fixed assets and create industrial construction in knowledge-intensive sectors of the economy.

Let's look at Table 10. SWOT analysis of Azerbaijan export potential changings. As is seen, economic development is a process of economic growth based on the growth of production capacity in the country, that is, the ability to transform its production activities. The existing low production capabilities and the extraction of natural resources, coupled with cheap labor, do not create a solid and real basis for real economic growth and development. Naturally, technical, technological either organizational and managerial changes underlie economic growth and development for transfer to Industry 5.0. The emerging innovations are important in setting technological priorities in those industries where it is combined with a quality component.



**Table 10**SWOT analysis of Azerbaijan export potential changings  
in transfer process to Industry 5.0

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>– export of "Azercosmos" services is constantly growing and covers European countries, Pakistan and the UAE;</li> <li>– the policy pursued by the state helps to increase the innovation component in the economic structure of the country</li> </ul>	<ul style="list-style-type: none"> <li>– low indicators of Azerbaijan indicate a low level of complexity of the industrial structure, which is confirmed by the index of industrial exports per capita</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>– the indicator of the R&amp;D indicator of Azerbaijan speaks of progress in high-tech industries not only in industry, but throughout the economy;</li> <li>– it is advisable to improve the quality component of Azerbaijan, which in turn will contribute to the growth of the intensity index and industrialization of the country;</li> <li>– the introduction of innovative systems requires a certain level of training of qualified personnel</li> </ul>	<ul style="list-style-type: none"> <li>– Azerbaijan is exposed to external shocks through foreign trade, financial channels and commodity markets;</li> <li>– Azerbaijan business representatives are interested in short-term projects that guarantee enterprise income and less risk</li> </ul>

**Note:** the table is based on [33–39]

The situation is improving, but the manufacturing industries have not yet improved their position, as there is no system and focus on specific priorities for sustainable economic development. Azerbaijan national economy development's priorities are next:

- production, financial, organizational, marketing and labor resources in manufacturing fields;
- facilitate the transition to an innovative stage of growth;
- concentrate of all attracting investments in manufacturing fields;
- attract the qualified personnel that ensure the production of modern and high-tech products in manufacturing fields;
- achieve sustainable development of economy and increase its competitiveness;
- accelerate the reconstruction, rehabilitation and privatization of idle or unprofitable production facilities;
- supporting the coordination of research activities with practice;
- establishment of working mechanisms to expand and improve the quality of scientific research and training for the development of the regions;
- establishment of mechanisms to encourage the development of other comparative advantages and value-added products and services in the regions;
- improving state support mechanisms to increase agricultural production by intensive methods;
- supporting the development of agro-industrial integration.

The above measures can be successfully applied to the economies of Georgia, Kazakhstan and Uzbekistan, since the economies of these countries have identical indicators of innovation and economic attractiveness.

Azerbaijan's innovation-oriented development depends of both:

- 1) knowledge-intensive products and services;
- 2) information technologies as a development process.

Such areas include the creation and management of artificial satellites, chemical and machine-building indus-

tries, production of pharmaceutical and cosmetic products, as well as the field of information technologies, the ICT sector in transfer process to Industry 5.0.

Azerbaijan has intellectual potential like as in Baltic countries, but the country is not yet a supplier of innovative technologies to the domestic market. Suppliers of innovative technologies are foreign innovative systems, software, updates, servers and other innovative technological products and services [34].

Foreign investments in the reconstruction of cities and industrial infrastructures of the economy, as well as internal financial sources of industrial enterprises and government financial support in development of economy digitalization have created the preconditions for the introduction of not only investment and innovation projects, but also radical innovations in Azerbaijan economy administrating.

#### 4. Conclusions

Based on the object and objectives of the study, the authors came to the following conclusions:

1. Innovative transformations strengthen the economy and create preconditions for a successful transition to Industry 5.0.

2. Despite the fact that Azerbaijan ranks 28th among the countries with an average economy in the world, the intensity and industrialization index is slowly but surely growing. The efficiency index is higher (61.9 in 2021) than in Estonia (69.3), despite the fact that the innovation index is below average (37 in 2021). Azerbaijan's GII moved from 82nd position in 2020 to 89th in 2023. Investments attracted to technological processes increased 16 times from 2010 to 2022.

3. Azerbaijan is actively attracting foreign investment to restore the economy and infrastructure in the liberated lands. The main investors are the countries of the former USSR, the countries that have been members of the Organization of Turkic Countries since 2009. Azerbaijan not only actively attracts foreign investment, but also develops bilateral agreements with partner countries of the Organization of Turkic Countries.

Last years has been increased the importance of technological factor in Azerbaijan – a shift from increasing capacity to more efficient technologies, saving resources and increasing labor productivity. Low technological capabilities for own development lead to dependence on imports of goods and services for technological modernization.

As a result, it can be noted that low productivity is a consequence of an imperfect and inefficient economic structure. Therefore, in Azerbaijan it is important to strengthen the technical and technological process in economic development, strengthen the process of modernization and restructuring, which will help improve the country's economic position and strengthen the innovative basis of the economy in process transformation to Industry 5.0.

Authors note that Azerbaijan government decision-making system and the development and implementation of innovative technologies' system itself for government sectors must be flexible.

Azerbaijan enterprises should apply legal and financial support mechanisms to the import of equipment aimed at increasing the industrial potential for the production of export-oriented products based on innovation in process of transition to Industry 5.0.

For the transition to Industry 5.0 Azerbaijan's economy will apply:

- 1) export-oriented;
- 2) reserve-oriented development strategies.

The main goal of the export-oriented strategy is to ensure the expected reduction of primary resources and energy resources in the future and support the increase in the volume of exports of high-tech products to world markets. Through the resource-based strategy, Azerbaijan aims to increase exports by reducing the share of primary resources and energy exports.

### Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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### Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating this work.

### References

1. Forster, K. (2022). *Digital Insights* #69. Industry 5.0: Part 4 of 4. Available at: <https://www.momenta.one/insights/manufacturing-core-principles-industry5-advisory>
2. *Industry 5.0*. European Commission. Available at: [https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/industry-50\\_en](https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/industry-50_en)
3. Demir, K. A., Döven, G., Sezen, B. (2019). Industry 5.0 and Human-Robot Co-working. *Procedia Computer Science*, 158, 688–695. <https://doi.org/10.1016/j.procs.2019.09.104>
4. Maddikunta, P. K. R., Pham, Q.-V., B. P., Deepa, N., Dev, K., Gadekallu, T. R., Ruby, R., Liyanage, M. (2022). Industry 5.0: A survey on enabling technologies and potential applications. *Journal of Industrial Information Integration*, 26, 100257. <https://doi.org/10.1016/j.jii.2021.100257>
5. Yuzbashiyeva, G. Z., Abasova, S. H., Yuzbashiyev, I. H. (2023). Innovative Factors' Influencing to Azerbaijan National Economy Transformation. *International Journal of Applied Engineering and Technology*, 5 (4), 217–227.
6. Yuzbashiyeva, G. Z., Abasova, S. H. (2022). Innovations and Investments as a Sources of Economic Growth in Azerbaijan in Pandemic Conditions. *Proceedings of the IX International Scientific and Practical Conference "Current Problems of Social and Labour Relations" (ISPC-CPSLR 2021)*. <https://doi.org/10.2991/assehr.k.220208.074>
7. Yuzbashiyeva, G. Z., Abasova, S. H., Yuzbashiyev, I. H. (2022). Impact of Innovative Development on State Regulation of the National Economy: Comparative Data of Former USSR Countries. *Endless Light in Science*, 2, 109–117.
8. Abasova, S. H. (2013). *State regulation of innovation processes in Azerbaijan industry*. Munich: LAP-Lambert Academic Publishing, 172.
9. Business and Economic Data for 200 Countries. Tajikistan Economy Indicators (2023). *TheGlobalEconomy.com*. Available at: [https://ru.theglobaleconomy.com/Tajikistan/Education\\_spen](https://ru.theglobaleconomy.com/Tajikistan/Education_spen)
10. Fuel exports (% of merchandise export). *The World Bank. IBRD-IDA. DATA*. Available at: <https://data.worldbank.org/indicator/TX.VAL.FUEL.ZS.UN>
11. *UNECE Statistical Database* (2023) Available at: <https://unece.org/data>
12. Business and Economic Data for 200 Countries. Azerbaijan Innovation Index (2023). *TheGlobalEconomy.com*. Available at: [https://www.theglobaleconomy.com/Azerbaijan/GII\\_Index/](https://www.theglobaleconomy.com/Azerbaijan/GII_Index/)
13. Researchers in R&D (per million people). UNESCO Institute for Statistics (UIS) (2023). *The World Bank. DATA*. Available at: <https://data.worldbank.org/indicator/SP.POP.SCIE.RD.P6?view=chart>
14. Government Expenditure on Education, total (% of GDP). UNESCO Institute for Statistics (UIS) (2023). *The World Bank. DATA*. Available at: <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS?view=chart>
15. Azerbaijan ranking in the Global Innovation Index 2023 (2023). *Global Innovation Index*. Available at: <https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023/az.pdf>
16. Global Attractiveness Index (2023). *An Official Website of the European Union*. Available at: <https://ec.europa.eu/search/?QueryText=global%20attractiveness%20index>
17. *UNIDO Data Portal*. Available at: <https://stat.unido.org/data/table>
18. Composite Indicators & Scoreboards Explorer (2023). *European Commission*. Available at: <https://composite-indicators.jrc.ec.europa.eu/explorer/explorer/indices>
19. Dutta, S., Lanvin, B., Wunsch-Vincent, S. (Eds.) (2018). Azerbaijan ranking. *Global Innovation Index 2018*. Available at: [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2018.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018.pdf)
20. Dutta, S., Lanvin, B., Wunsch-Vincent, S. (Eds.) (2019). Azerbaijan ranking. *Global Innovation Index 2019*. Available at: [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2019.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2019.pdf)
21. Dutta, S., Lanvin, B., Wunsch-Vincent, S. (Eds.) (2020). Azerbaijan ranking. *Global Innovation Index 2020*. Available at: [www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2020/az.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020/az.pdf)
22. Dutta, S., Lanvin, B., León, L. R., Wunsch-Vincent, S. (Eds.) (2021). Azerbaijan ranking. *Global Innovation Index 2021*. Available at: [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2021.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf)
23. Rankings for Azerbaijan (2020–2022) (2022). *Global Innovation Index 2022*. Available at: [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_2000\\_2022/az.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000_2022/az.pdf)
24. Azerbaijan. *Global Innovation Index 2022*. (2022) Available at: [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_2000\\_2022/az.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000_2022/az.pdf)
25. *Azerbaijan product catalog*. Available at: <https://az.all.biz/buy>
26. *Statistical issue. Azerbaijan Statistic Indicators* (2023). Baku: Azerbaijan Statistical Committee, 814.
27. *Statistical issue. Azerbaijan industry* (2023). Baku: Azerbaijan Statistical Committee, 245. Available at: <https://www.stat.gov.az/source/industry/>
28. *Statistical issue. The social-economic development of regions during 2019–2023* (2021). Baku: Azerbaijan Statistical Committee, 1, 728.
29. *Sumgayit Technological Park* (2018). Sumgayit: STP publishing.
30. *Statistic Issue. Construction in Azerbaijan* (2023). Baku: The State Statistic Committee, 248. Available at: <https://www.stat.gov.az/source/construction/>
31. Prezident İlham Aliyev provel press-konferenciü dlia predstavitelei mestnykh i zarubezhnykh SMI (2021). *Azerbaijan State Information Agency*. Available at: [https://azertag.az/ru/xeber/prezident\\_ilham\\_aliev\\_provel\\_press\\_konferenciuyu\\_dlya\\_prestavitelei\\_mestnyh\\_i\\_zarubezhnykh\\_smi\\_obnovleno\\_7\\_video-1722283](https://azertag.az/ru/xeber/prezident_ilham_aliev_provel_press_konferenciuyu_dlya_prestavitelei_mestnyh_i_zarubezhnykh_smi_obnovleno_7_video-1722283)
32. Aliyeva, G. (2022). *Lokomotiv nauchnogo progressa. Interview with acad. Bakinskii rabochii*. Available at: <https://kqkiamea.az/ru/news/2541/>
33. Azercosmos sees hike in revenues from exports of services (2023). *Report News Agency*. Available at: <https://report.az/en/ict/azercosmos-sees-hike-in-revenues-from-exports-of-services/>
34. *R&D Expenditure Level in the World Countries* (2023). UNESCO. Available at: <https://gtmarket.ru/ratings/research-and-development-expenditure>
35. Ekspert, v dollarakh – Klassatsiia stran. Business and Economic Data for 200 Countries (2023). *TheGlobalEconomy.com*. Available at: [https://ru.theglobaleconomy.com/rankings/exports\\_dollars/](https://ru.theglobaleconomy.com/rankings/exports_dollars/)
36. Trade Map – Trade Statistics for International Business Development. *ITC – International Trade Centre*. Available at: <https://www.trademap.org/Index.aspx>

37. Yuzbashiyeva, G. Z., Abasova, S. H., Yuzbashiye, I. H. (2024). Innovations and structural problems of industry: comparative analysis of Azerbaijan's indicators with Turkish republics. *Challenges and issues of modern science*, 2, 358–367. Available at: <https://cims.fti.dp.ua/j/article/view/122>
38. Yuzbashiyeva, G. Z., Abasova, S. H., Yuzbashiye, I. H. (2024). Features of Regional development of Azerbaijan. *ECO Economic Journal*, 1 (9), 38–54. Available at: <https://eco.int/wp-content/uploads/2024/10/24.10.22-ECO-Journal-Oct24V2.pdf>
39. Yuzbashiyeva, G. Z., Abasova, S. H., Yuzbashiye, I. H. (2024). Structural GDP growth rates: comparative analysis of indicators of Eurasian countries. *Endless Light in Science*, 4, 37–46.

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