

## TECHNICAL AND TECHNOLOGICAL MODERNIZATION OF AZERBAIJAN ECONOMY: SOLUTIONS

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### INTRODUCTION

The technical and technological modernization of the Azerbaijan economy at the current stage of development does not yet meet the requirements of long-term economic growth and development. Today, a lot of work is being done to overcome the technical and technological gap with developed countries, despite some local achievements, which requires a large-scale one. The lack of modern market relations, the low level of competition is one of the causes of technical and technological problems, which reveals the need to find our own way of effective modernization of the economy.

#### 1. AZERBAIJAN ECONOMY IN A COMPETITIVE ENVIRONMENT

As you know, a high level of competition can contribute to the deterioration of the country's economic development, as well as its low level or complete absence. For Azerbaijan this statement is relevant, due to the fact that there is still no mass market for innovations. There is a jump-like model of technical and technological development due to the presence of targeted incentives for enterprises. The need is revealed to determine how the innovation market is connected with the innovation policy of the state.

Azerbaijan Government is taking many measures to strengthen the innovative development of economy, actively contributing to its technical and technological growth and development. But the full development of innovative technologies' sector is hindered by foreign manufacturers that occupy a leading position in the technology market. This problem is closely related to the problem that hinders the development of exports of innovative products and services from the country.

The main prerequisite for the transition is a change in the relative efficiency of borrowing and innovation.

Table 1: High-tech exports and innovation index for the former USSR countries [4-5]

	Export of high technologies, mln. \$ and place						Innovation index and place			
	2018	2019	2020	2021	2018	2019	2020	2021		
Azerbaijan	21.18/104	28.00/92	33.91/89	22.21/76	30.20/81	30.20/84	27.20/82	28.40/80		
Belarus	716.99/56	756.91/57	801.65/55	856.74/48	29.40/85	32.10/72	31.30/64	32.60/62		
Georgia	26.95/101	19.35/101	14.03/100	16.89/79	35.00/58	37.00/48	31.80/63	32.40/63		
Kazakhstan	1762.98/47	2251.49/43	2492.25/43	-	31.40/73	31.00/79	28.60/77	28.60/79		
Kyrgyzstan	40.02/92	29.88/90	27.64/72	84.09/66	27.60/93	28.40/90	24.50/93	24.50/98		
Latvia	1881.86/46	1471.92/48	1837.83/47	1944.25/41	43.20/34	43.20/34	41.10/36	40.00/38		
Lithuania	2516.32/41	2527.02/41	2619.24/40	3106.96/36	-	41.50/38	39.20/40	39.90/39		
Moldova	18.94/107	24.97/95	18.9/95	21.77/77	37.60/47	35.50/58	33.00/59	32.30/64		
Russia	10183.01/31	10864.83/30	6524.88/33	10553.18/26	37.90/45	37.60/46	35.60/48	36.60/45		
Tajikistan	7.13/118	7.87/117	1.55/122	-	26.50/100	26.40/100	22.20/109	23.90/103		
Turkmenistan	12.43/109	20.48/99	42.22/87	15.07/80	-	-	24.5-94	27.40/86		
Uzbekistan	1247.56/49	1247.99/49	1175.95/51	1283.59/43	38.50/42	37.40/47	36.30/45	35.60/49		
Ukraine	1909.86/45	1735.68/47	2169.73/42	2680.43/38	50.50/25	50.00/24	48.30/25	49.90/21		

The lack of development of the innovation sector is the low demand for innovative products and services from the state and business [11]. Neither the private nor the public sector has yet shown sufficient interest in innovation [4-5] (Table 1).

We can see a slight increase in high-tech exports contributed to an increase in the innovation index and an improvement in the positions held (in 2018 - 30.20/81, in 2020 - 27.20/82, in 2021 - 28.40/80) in Azerbaijan. High-tech export positions improved (percentage of exports of finished products) in 2015 - 13.93 (109th place), in 2020. - 33.91 (86th place). Belarus has got the best position: in 2018 – 716.99/56 (million dollars/seat), in 2019 – 756.91/37 and in 2020. – 801.65/55.

Table 1. demonstrates a slight increase in high-tech exports contributed to an increase in the innovation index and an improvement in the positions held of Belarus (2018 - 29.40/85, 2020 - 31.30/64, 2021 - 32.60/62). High-tech export positions improved (percentage of exports of finished products) in 2015 - 577.13 (59th place), in 2020 - 801.65 (55th place) .

High-tech export positions improved (percentage of exports of finished products) in 2015 in Georgia. - 34.24 (98th place), in 2020 - 14.03 (96th place). Kazakhstan - in 2018 – 176.98/47 (million dollars/seat), in 2019 – 2251.49/43. Some growth in high-tech exports has not yet contributed to an increase in the innovation index and improvement in positions (in 2018 - 31.40/73, in 2020 - 28.60/77, in 2021 - 28.60/79).

High-tech export positions of Kyrgyzstan (percentage of exports of finished products) worsened in 2015 - 2855.23 (38th place), in 2020 - 2492.25 (43rd place). Some growth in high-tech exports has not yet contributed to an increase in the innovation index and improvement in positions (in 2018 - 27.60/93, in 2020 - 24.50/93, in 2021 - 24.50/98).

The share of Latvia exports of finished products has improved since 2015. Some growth in exports of high technologies has not yet contributed to an increase in the innovation index and improvement in positions (in 2018 - 43.20/34, in 2020 - 41.10/36, in 2021 - 40.00/38).

High-tech Lithuania export positions improved (percentage of exports of finished products) in 2015 - 1919.84 (42nd place), in 2020 - 2619.11 (41st place) - in 2018 – 18.94/107 (million dollars/seat), in 2019 – 24.97/95 and in 2020 - 18.9/95.

A slight increase in Moldova high-tech exports did not contribute to an increase in the innovation index and improvement in positions (in 2018 - 37.60/47, in 2020 - 33.00/59, in 2021 - 32.30/64). High-tech export positions improved (percentage of exports of finished products) in 2015 - 20.72 (103rd place), in 2020. - 18.90 (92nd place).

Table 1. shows some growth in Russia exports of high technologies contributed to the improvement of the innovation index and the

improvement of the positions held (in 2018 - 37.90/45, in 2020 - 35.60/48, in 2021 - 36.60/45). High-tech Russia export positions (percentage of exports of finished products) worsened in 2015 - 11449.52 (28th place), in 2020 - 6603.64 (33rd place).

The growth in Uzbekistan exports of high technologies contributed to an increase in the innovation index and improved positions (in 2020 - 24.50/94, in 2021 - 27.40/86). For high-tech exports in 2020 - 42.22 (84th place).

A slight increase in high-tech exports in Ukraine did not contribute to an increase in the innovation index and improvement in positions (in 2018 - 38.50/42, in 2020 - 36.30/45, in 2021 - 35.60/49).

A slight increase in high-tech Estonia exports contributed to an increase in the innovation index and improved positions (in 2018 - 50.50/25, in 2020 - 48.30/25, in 2021 - 49.90/21). High-tech export positions (percentage of exports of finished products) worsened in 2015 - 2052.94 (41st place), in 2020 - 2150.75 (45th place).

This confirmation is also provided by the regulation on the export of ICT services. Consider the data for the countries of the former USSR (Table 2.).

As shown in Table 2, in 2021 export of ICT services in Azerbaijan in the total percentage of export of services amounted to 2.54%, in Belarus - 31.3%, in Georgia - 8.5%, in Kazakhstan - 3.03%, in Kyrgyzstan - 2.6%, in Latvia - 18.5%, in Lithuania - 9.14%, in Moldova - 24.6%, in Russia - 12.99%, in Tajikistan - 3.19%, in Uzbekistan - 7.81%, in Ukraine - 38.64%, in Estonia - 21.43%.

Activation of state impact on country economic development will contribute to optimizing process of production structure in order to ensure the efficiency of economic systems' functioning. The main thing is to ensure economic growth and development through qualitative factors, including the achievements of science and new knowledge, since it is not just innovations and qualifications that are important, but their rational balance in order to obtain synergistic effects from their use.

It is advisable to transform and restructure industries, since the structure of industry is one-sided/ For example in 2021 industry structure consist from mining - 65.6%, processing (manufacturing) - 28.8%, power and water supply - 5.6%. In 2000 industry structure consist from mining - 53.5%, processing - 31.3%, power industry - 15.2%; in 2008: mining - 78.6%, processing - 17.7%, power industry - 4.7% [2].

The technological level of an economy depends on three components:

1. Disposal of obsolete and loss of qualities of existing technologies over time;
2. Positive activity of the authorities for technological modernization

based on the existing power potential;

3. Market processes for the creation and implementation of existing inventions (assumes the activity of the innovation market, depending on the potential number of real entrepreneurs).

Table 2: Export of ICT services  
(in balance of payments, current \$ and in %) [3]

	Export of ICT services (balance of payments, current \$)				Exports of ICT services (% of exports of services, balance of payments)			
	2015	2019	2020	2021	2015	2019	2020	2021
Azerbaijan	86.82	58.44	65.2	96.3	2.96	1.6	2.5	2.54
Belarus	1004.7	2412.5	2700.2	3220.3	11.4	25.0	30.7	31.3
Georgia	45.0	113.8	113.9	215.9	1.9	2.5	7.2	8.5
Kazakhstan	550.3	131.6	144.95	175.9	2.09	1.7	2.9	3.03
Kyrgyzstan	42.4	14.7	13.8	13.5	2.3	1.4	3.2	2.6
Latvia	400.3	948.1	973.95	1133.94	7.04	15.2	18.1	18.5
Lithuania	284.1	759.2	1087.7	1464.6	3.64	5.72	8.71	9.14
Moldova	162.0	257.9	302.8	401.7	16.3	16.7	23.7	24.6
Russia	3933.5	5489.4	5936.2	7232.3	6.85	8.86	12.4	12.99
Tajikistan	12.8	6.8	5.7	4.7	4.92	2.82	4.11	3.19
Turkmenistan								
Uzbekistan	206.6	165.4	166.5	176.3	10.1	5.34	9.80	7.81
Ukraine	2105.0	4331.0	5181.0	7107.0	13.72	24.80	33.29	38.64
Estonia	509.3	1042.2	1132.9	2085.3	9.04	12.95	17.3	21.43

A twofold situation has developed: on the one hand, there are existing obstacles to full-fledged market processes and competition (and for the development of an innovative market), on the other hand, the state can participate in the creation of technological innovations. It can be said that the technological development of the country depends on the inventive, entrepreneurial ability of the population and on the activity of state power. The spasmodic and uneven nature of technological development is justified by the growth or slowdown in the pace of technological progress (Table 3).

Structural independence in Azerbaijan is low in 2020 (1.28), but improved in relation to 2018 (1.70), despite the measures taken to stimulate the development of industry, since the structure depends on the world market conditions [7, 12].

Table 3: Fixed assets and investments  
in fixed assets by industry in Azerbaijan [1]

Branches/years	2018	2019	2020	2021
1. Fixed assets, total %	100	100	100	100
Mining	71.1	74.1	67.3	62.2
Manufacturing	11.3	7.4	23.8	19.2
Electricity and water supply	17.6	18.5	8.9	18.6
2. Investments in fixed assets, %	100	100	100	100
Mining	67.1	61.3	61.9	64.2
Manufacturing	16.9	26.7	28.8	26.9
Electricity and water supply	16.0	12.0	9.3	8.9
3. Structural independence	1.70	1.44	1.28	-
4. Economic complexity of the country, place	124	120	-	-

As noted above, a sustainable economy that can compete on the basis of innovation requires a certain level of economic complexity. The economic complexity of a country is a reflection of its current competitiveness and determines its potential for future competitiveness. Therefore, in order to improve the level of economic complexity, it is advisable to carry out real structural changes in order to increase the country's competitiveness and the level of development sustainability (the level of complexity of the economy in 2018 is 124th place, in 2019 - 120th place).

## 2. THE IMPACT OF MODERNIZATION ON THE STRUCTURE OF THE NATIONAL ECONOMY OF AZERBAIJAN

Modernization is finding the priorities of future in reality and finding the best ways to this future. Structural changes occur due to factors of production, investment and innovation, but high-level structural changes are created due to innovations in the conditions of economic growth, which are more effective. This leads to the development of infrastructure, the

growth of qualifications, the expansion of sales opportunities, the growth of internal competition, investment in reducing production costs, and increasing the overall potential. Structural changes, at the level of factors, are carried out due to the availability of natural resources, surplus and cheap labor.

Initially, on this basis, economic growth is ensured, then mechanisms for changing proportions, but the most effective structural changes are achieved when using sources of national wealth. This, as noted above, revealed the need to create conditions not for the economic growth of an inefficient structure, but for real innovative growth and development, which involves improving the structural quality of the economic system and expanding its capabilities in terms of innovation; the expediency of the relationship between science, business and the state to solve existing problems.

If the economy remains based on raw materials, then economic growth will never be able to turn into economic progress. If the economy becomes technological but does not expand, economic growth will be impossible. The problem of quality remains the main economic problem. This is especially important, since the comparative advantage that determines national competitive advantages is now being formed. As noted above, the real and effective implementation of many projects does not depend on the amount of investment (invested money), but on the quality and efficiency of the management system [12].

It is expedient to optimize public spending more effectively. It is not just the direction of money as a resource that is important, the return on them is important. Effective innovation processes should be iterative, which ensures that promising ideas are quickly developed in practice and unsuccessful ideas are discarded. The full development of the sector of innovative technologies is hampered by foreign manufacturers that occupy a leading position in the technology market [6].

Now most of the oil and gas equipment is imported from abroad. As a result, millions of dollars are being invested in the development of foreign machine-building complexes, while the domestic machine-building industry does not have the means to develop, stimulate and regulate production, there is a process of artificial limitation of production at domestic enterprises [6].

Customers are focused on the purchase of imported equipment, specialized design institutes do not have the funds not only to design new modern models of equipment, but also to maintain the existing potential, difficulties with the sale of manufactured products. It is advisable to carry out a product leadership strategy that promotes an innovative way of economic development. The main elements of this strategy are: high quality,

market leadership, penetration into new markets.

The development of the economy and its modernization is associated with the need to change the structure of the economy. The main problem of industrial growth is [7, 12]:

- inefficient sectoral and technological structure of the industry (high-tech industries - 2-3% of output, although in developed countries 15-17%);
- low labor productivity; low level of competitiveness of domestic products in the world and domestic markets;
- high material intensity, energy intensity, import dependence, low use of public investment, low level of coordination, modern equipment is bought for the production of non-innovative products.

All this reveals the feasibility of a real definition of priorities for industrial development, restructuring, modernization and restructuring of industry, strengthening the development of high-tech science-intensive industries.

An important factor in economic growth is the economic structure, i.e. what potential growth it is capable of, what structural changes will lead to future growth, and what will slow it down. So far, there is a polarization in the development of extractive and manufacturing industries (2021: mining - 65.6%, processing - 28.8%). The economy is still dependent on oil, the structure of the economy has not changed radically. The pace and direction of development of the manufacturing industries will shape the future development of the economy, determine the optimal ratio between orientation to domestic markets and orientation to foreign markets [8].

In modern conditions, the main factor in intensifying economic growth is the strengthening of the role of the innovative component of the economy, which complements the existing growth factors. Small investments can lead to large profits, as the development of the innovative component gives a synergistic impetus to other industries [8].

An important initial methodological principle is the use of qualitative factors that ensure the introduction of the latest achievements of science, new possibilities of knowledge. It is not just innovations and qualifications of personnel that are important, but their rational correlation, which, given the systemic state of investment resources, contributes to obtaining additional synergistic effects from their use [8].

Modern economic growth is characterized by the leading importance of scientific, technical and technological progress and the intellectualization of the main factors of production. A characteristic feature of modern economic growth has been the transition to a continuous innovation process in management practice.

In Azerbaijan, the common problems of innovative development are the following [9-10]:

– lagging behind and growing gap from developed countries. A small percentage of industrial enterprises (5-6%) are developing and implementing technical and technological innovations; innovative products do not reach 1%, the share of science-intensive products in the world trade volume does not exceed 0.3-0.5%;

– R&D spending is a small percentage of GDP;

– low potential of applied science, which determines the sources of economic development. Science turned out to be unclaimed, its results are not 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 innovative development directions, existing personnel problems;

– at the heart of innovative development are not breakthrough, but inertial components.

The pandemic has revealed the existing problems, for the solution of which certain considerable financial resources are directed, but they cannot be solved only by directing funds there without changing the system of their organization, also, by raising tariffs for gas and electricity, we contribute to increased dependence on monopolists.

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

– for the introduction of innovative technologies in public administration, the state itself must be the producer and main supplier of these innovations to itself. That is, the production of all software products and technological base should be produced, supplied and serviced only by our own state-owned closed enterprises;

– a special system and control of data transmission over networks is needed (encryption and coding in parts, and then their combination into a single whole);

– the introduction of innovative systems involves a certain level of training of qualified personnel, but to simplify this process, it is advisable to use the simplest interface model. also, before the introduction of 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 state industries should be flexible.

The task of the state is to ensure the sustainability of industrialization

process through appropriate consistent policy's implementation. Increasing economic complexity is impossible without setting real priorities for growth and development [6]. State policy should be built, highlighting a range of priority areas, concentrating resources on them, while moving towards the innovative stage of economic development through attracting investments that carry modern technologies that, in combination with qualified personnel and scientific, technical and technical developments, can relatively quickly ensure the competitiveness and self-sufficiency of the economy [11].

Increasing the level of investment in the economy will allow moving from a factor-driven stage to an investment-driven stage. Public investment promotes structural adjustment, growth and development in order to accelerate the process of economic transformation, achieve sustainability without reducing social contributions.

## CONCLUSION

Due to the intensification of the process of globalization, regionalization, the emergence of world technological leaders, it indicates the expediency of state support not only at the stage of inception, but also subsequently, provided that the situation does not become more complicated. Nowadays, there is no mass culture of entrepreneurship that promotes the development and implementation of new production technologies. This situation has developed due to the presence of a low level of a full-fledged innovation market.

Due to the intensification of the process of globalization, regionalization, the emergence of world technological leaders, it indicates the expediency of state support not only at the stage of inception, but also subsequently, provided that the situation does not become more complicated. Nowadays, there is no mass culture of entrepreneurship that promotes the development and implementation of new production technologies. This situation has developed due to the presence of a low level of a full-fledged innovation market.

Modern technologies have become complex and large-scale, and small business structures cannot implement them, which requires the presence of large corporations with state support in order to turn them into global leaders in their respective industries. Competitive processes have embraced low-tech sectors of the economy (shops, restaurants, construction, tourism, etc.). It is important to diversify into high-tech industries (micro-electronics, biotechnology, shipbuilding, etc.), which will determine the future development of the country.

The direction of investments by the state and the private sector in

certain priorities, coupled with the creation of new and development of existing industries, contributes to restructuring and restructuring of industry.

It is expedient to balance the efforts of the state and business, creating conditions for the transition to the investment stage of growth and development. It is important to constantly increase labor productivity in existing industries by improving the quality of products, giving them new consumer properties, improving manufacturing technology or increasing production efficiency. It is important to develop the ability to compete.

The strategic objective is:

- real, not endless attraction of investments;
- solution of those tasks that can push the economy to development and increase its budgetary security;
- formation of the system of goals, the achievement of which is in the hands of the regional authorities.

The state is carrying out a technological restructuring, but the process of transferring these enterprises to the private sector continues, which implies the transfer of all finances to the private sector. This complicates the process of control and implementation of structural changes. To improve the efficiency of state asset management, it is important to introduce strategic planning, which gives a clear forecast and guidelines for corporations and businesses to determine their strategies based on a common development line.

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