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THE TECHNOLOGICAL LEVELS OF PRODUCTION AND CONSUMPTION OF BELARUS, RUSSIA, AND KAZAKHSTAN

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Abstract

Innovative economic growth is not only based on the development of technologies that ensure the growth of aggregate supply. This type of growth is impossible without constant innovation in consumer goods that drive growth in aggregate demand. At the same time, in modern economic theory, the attention of researchers focuses mainly on the development of engineering and technology and the role of innovation in the field of consumer goods has not been studied separately from technical and technological innovations. The article analyzes the special roles of production innovations and consumer innovations in economic growth. A methodology developed by the author is presented for measuring the technological level of consumption, as well as for comparing the production technological level and the consumption technological level in the national economy. Based on statistical data, technological levels of production and consumption were calculated for the Russian Federation, the Republic of Belarus, and Kazakhstan. The results of analysis of the dynamics of the production and consumption technological levels are presented. The level of correspondence between the technological capabilities of production and consumption within the national economies of the countries under consideration is evaluated. Such an analysis allows us to anticipate possible threats to the development of countries occupying a catching-up position in innovative development, as well as to anticipate the danger of a slowdown in economic growth for countries that are leaders in innovative development.

Keywords: *Innovations. Technological level. Techno-economic paradigm. Consumer-economic paradigm. Economic growth. Quantitative assessment.*

1 INTRODUCTION

Innovative economic growth, characterized by a sustainable and continuous increase in living standards, is not only the development of technologies that ensure the growth of aggregate supply. This type of growth would not be possible

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without constant innovation in consumer goods, which drives growth in aggregate demand. The mechanisms and results of the impact on economic growth of innovations in production and consuming goods are fundamentally different.

At the same time, in modern economic theory, the attention of researchers is focused mainly on the development of engineering and technology, and the role of innovation in the field of consumer goods has not been studied separately from technical and technological innovation. Known approaches to assessing the technological level of a national economic system are based mainly on assessing its production facilities.

The purpose of this study is to develop and test, using the example of the Russian Federation, the Republic of Belarus, and Kazakhstan, a methodology for measuring the technological level of consumption, as well as for comparing the technological levels of production and consumption in the national economy.

To achieve this purpose, it is necessary:

1. to determine indicators that allow an objective assessment and comparison of the technological levels of production and consumption in the national economy.
2. calculate the values of these indicators for the Republic of Belarus, the Russian Federation, and Kazakhstan.
3. analyze the calculation results obtained for the countries under study.

2 PRODUCTION AND CONSUMPTION INNOVATIONS AND ECONOMIC GROWTH

Innovative economic growth requires not only innovation in the field of production goods (in other words, in the field of engineering and technology) but also innovation in the field of consumer goods, i.e., goods and services designed to satisfy human needs directly.

It is known that innovations in the field of production goods (hereinafter referred to as production innovations) ensure an increase in labor productivity and, ultimately, an increase in the volume of production of consumer goods per capita. In addition, innovative equipment and technologies open opportunities for the creation of innovative consumer goods, the production of which was impossible at the previous level of technological development.

Innovations in the field of consumer goods (hereinafter referred to as consumer innovations) consist of creating fundamentally new ones, expanding the range, and improving the quality of already-known goods. Consumer innovations stimulate the population to purchase these goods, even without waiting for the complete physical wear and tear of old, previously purchased items with similar functions. This increases per capita consumption.

If innovation occurs mainly in the direction of improving production processes, providing a sharp increase in the output of traditional consumer goods, and at the same time not enough attention is paid to improving the consumer goods themselves, then, sooner or later, markets will become oversaturated with traditional consumer goods. In such a situation, producers cannot sell the volumes of goods produced, which may be the beginning of a recession in the economy. Even if traditional goods that the population already possesses are offered to them at reduced prices, people still do not want to purchase what they already have in excess quantities (Malkevich, Tikhomirov, & Zenchuk, 2003).

We can say that the lack of production innovation limits economic growth on the aggregate supply side, and the lack of consumer innovation limits economic growth on the aggregate demand side.

Joseph Schumpeter emphasized that the development of innovation is discrete in time. The periods during which a surge of innovation occurs Schumpeter called “clusters” (Schumpeter, 1982), but the terms “waves of innovation” and “techno-economic paradigm” have become more established.

A techno-economic paradigm is understood as a set of related industries that have a unified technical level and develop synchronously. The change in the leading, dominant techno-economic paradigms in the economy of a country or of the world sets the unevenness of economic growth, which expresses itself in the form of economic cycles. Such scientists as N. Kondratiev (2002), J. Schumpeter (2008), T. Kuczynski, K. Freeman, and K. Perez contributed to the development of

the theory of techno-economic paradigms (waves of innovation). The theories of these researchers were continued by V.F. Bainev (2020), S. Yu. Glazyev (1993), (1990), D. S. Lvov (1986), (1990), Yu. V. Yakovets (1999), and others.

However, published research on this topic has not examined the role of consumer innovation separately from production innovation. Innovative consumer goods and the consumer-economic paradigms formed by them, as a rule, are considered inseparable from the corresponding techno-economic paradigms, as their inseparable part.

However, innovative consumer goods play an independent role in economic growth and can be sold and consumed outside the corresponding techno-economic paradigm to which they belong. Almost any consumer goods of earlier techno-economic paradigms can be produced using the equipment and technologies of later paradigms. For example, ordinary bread can be baked both in a village oven and at a bakery equipped with various types of industrial equipment (II-IV paradigm), in a home electronic bread machine (V paradigm), and perhaps soon with the participation of a home android robot or printed on a food 3D printer (VI paradigm). Cleaning the floor in a home can be done with a broom and a damp cloth, with an electric vacuum cleaner (IV paradigm), with a robotic vacuum cleaner (VI paradigm), and using an android robot (VI paradigm).

And vice versa, almost any consumer goods of higher consumer-economic paradigms can be imported into a country that does not have the corresponding techno-economic paradigm but is at earlier stages of technological development. For example, today one can see how the population of countries that do not have technologies for the production of computers and mobile phones (V paradigm) actively use these goods. In this case, there is a situation in which the consumer-economic paradigm in the country is ahead of the techno-economic paradigm by time, and there is also a discrepancy between the techno-economic and consumer-economic paradigms geographically, across countries.

Considering the above, we will understand the consumer-economic paradigms as a set of interrelated methods and processes of satisfying the personal wants and needs of the population, for which the production of consumer goods is carried out using equipment and technologies of the corresponding techno-economic paradigm, and in which consumer goods predominate, which cannot be produced using technologies of lower techno-economic paradigms.

While each new techno-economic paradigm steadily brings with it an increase in labor productivity (based on mechanization, electrification, automation of production, the beginning of the intellectualization of the technosphere), in other words, an increase in production per capita, each new consumer-economic paradigm steadily brings with it an increase in consumption per capita.

In a national economic system, at any given time, there are simultaneously several techno-economic paradigms, among which one can distinguish the main, dominant paradigm, which characterizes the main directions of development of the economic system at a given time (Lvov, D.S.; Glazyev, S.Yu., 1986). In the same way, at any given time, several consumer-economic paradigms simultaneously exist in the national economy, and they may not coincide with the current techno-economic paradigms.

The problem of consumer-economic paradigms is discussed in more detail in (Zianchuk, 2023).

For countries that are leaders in innovative development, the lag in the development of a new consumer-economic paradigm from the developed new techno-economic paradigm is fraught with the oversaturation of domestic markets and a subsequent recession in the economy. The export of excess amounts of consumer goods to other countries, to new geographic markets, can postpone the problem of oversaturation and recession for some time.

As a result of the export of innovative consumer goods from countries that are leaders in innovative development to catching-up countries, in these catching-up countries, the opposite situation may occur - an advance of the consumer-economic paradigm compared to the techno-economic paradigm. In exchange for imported innovative consumer goods, catching up countries usually export their natural resources, reducing their reserves. At the same time, in a catching-up

country, the demand of the population is "diverted" from consumer goods produced within the country to imported goods. This situation is not conducive to the development of the manufacturing sector of the catching-up country. Instead of investing in developing the production sector, society's resources are directed to expanding consumption.

3 MEASURING PRODUCTION AND CONSUMPTION TECHNOLOGICAL LEVELS

Objective quantitative measurement of the technological level of an economic system and its subsystems is a complex scientific problem that has not yet been fully resolved.

One of the possible approaches to quantitative measuring the technological level of an economic system was proposed by V.F. Baynyov and Zhang Bin (Bainev & Zhang, 2021), (Baynev, V.F., Makarevich, S. V., 2023). The approach they developed is based on the system of periodization of technical and technological progress by D. Lvov and S. Glazyev, which involves the identification of 1–6 techno-economic paradigms (Glazyev, Theory of long-term technical and economic development, 1993), (Glazyev, 1990). High-tech production belongs to the sixth techno-economic paradigm, while the technologies of the second techno-economic paradigm today are not just low, but backward.

To calculate the specific value of the indicator of the technological level of the national economy *TL* ("technological level") V.F. Bainev and Zhang Bin proposed a formula for the weighted arithmetic value (Bainev & Zhang, 2021), (Baynev, V.F., Makarevich, S. V., 2023):

$$TL = \frac{6 \cdot H + 5 \cdot MH + 4 \cdot ML + 3 \cdot L + 2 \cdot B + 6 \cdot HS + 3 \cdot S}{100\%} \quad (1)$$

where:

TL – is an indicator of the technological level of the economic system (national economy).

H – the share of economic activities related to high technology production, %.

MH – the share of economic activities related to medium-high technology production, %.

ML – the share of economic activities related to medium-low technology production, %.

L – the share of economic activities related to low technology production, %.

B – share of other economic activities related to the production of low backward technology, %.

HS – share of economic activities related to the high-tech services sector, %.

S – share of the sector of other (non-high-tech) services, %.

The bigger the share of economic activities related to higher techno-economic paradigms in the economic system, the greater the indicator of the technological level of the economic system.

It is necessary to clarify that the indicator proposed by V.F. Baynyov and Zhang Bin (formula 1), which the authors themselves called "the technological level of the national economy," is essentially the technological level of production, but not of the national economy. As shown above, the role the sales markets of innovative goods play in the functioning of the national economy is no less than the role of available production facilities and technologies. Therefore, the technological level of consumption also needs quantitative measurement and analysis.

To measure the technological level of consumption, a similar approach can be used:

$$TL_c = \frac{6 \cdot H_c + 5 \cdot MH_c + 4 \cdot ML_c + 3 \cdot L_c + 2 \cdot B_c + 6 \cdot HS_c + 3 \cdot S_c}{100\%} \quad (2)$$

where TL_c – is an indicator of the technological level of personal non-productive consumption in the economic system (national economy).

H_c – the share of consumed consumer goods created in high technology production, %.

MH_c – the share of consumed consumer goods created in medium-high technology production, %.

ML_c – the share of consumed consumer goods created in medium-low technology production, %.

L_c – the share of consumed consumer goods created in low technology production, %.

B_c – the share of consumed consumer goods created in the production of low backward technology, %.

HS_c – the share of consumed consumer services created in the high-tech services sector, %.

S_c – the share of consumed consumer services created in the sector of other (non-high-tech) services, %.

4 TECHNOLOGICAL LEVELS OF BELARUS, RUSSIA, AND KAZAKHSTAN

As an example of the application of the above methodology, a calculation of the technological levels of production and consumption for the Republic of Belarus, the Russian Federation, and Kazakhstan was carried out. The study examined a period of five years, from 2016 to 2021. The necessary data for later years has not yet been published in open access.

As the initial data for calculating the technological levels of production, official data on the production of goods and services in the countries under study by type of economic activity using the production method (by value-added) were taken (Statistics, 2023), (Economic statistics, 2023), (Official statistics, 2023).

Table 1 shows the structure of goods and services production in the Russian Federation, calculated based on official statistical data (Statistics, 2023).

Table 1 – Structure of production of goods and services in the Russian Federation by type of economic activity by production method (by value-added) for 2016 and 2021.

Code	Type of economic activity	Technological level identifier	2016		2021	
			GVA*, at current prices, million rubles	GVA %	GVA, at current prices, million rubles	GVA %
1	2	3	4	5	6	7
A	Agriculture, forestry, hunting, fishing, and fish farming	*L*	3 287 844.3	4.27	4 974 105.0	4.22
B	Mining	*L*	7 423 112.8	9.63	15 030 929.6	12.77
C	Manufacturing industries, including:	–	–	–	–	–
C10-C12	Production of food products, beverages, and tobacco products	*L*	1 583 149.1	2.05	2 439 928.7	2.07
C13-C15	Manufacture of textiles, clothing, leather, and related products	*L*	177 385.9	0.23	297 663.8	0.25
C 16	Wood processing and production of wood and cork products, except furniture, production of straw products and wicker materials	*L*	201 313.4	0.26	426 921.0	0.36
C 17	Production of paper and paper products	*L*	271 988.7	0.35	437 028.0	0.37
C 18	Printing activities and copying of information media	*L*	75 740.4	0.10	114 409.0	0.10
C 19	Production of coke and petroleum products	*ML*	1 475 262.1	1.91	3 083 973.4	2.62
C20	Production of chemicals and chemical products	*MH*	791 050.6	1.03	1 638 519.2	1.39
C21	Production of medicines and materials used for medical purposes	*H*	174 049.3	0.23	576 466.1	0.49
C22	Production of rubber and plastic products	*ML*	213 985.0	0.28	379 638.4	0.32
C23	Production of other non-metallic mineral products	*ML*	409 375.2	0.53	691 258.4	0.59
C24	Metallurgical production	*ML*	1 744 440.4	2.26	3 715 966.7	3.16
C 25	Production of finished metal products, except machinery and equipment	*ML*	711 023.2	0.92	988 996.7	0.84
C26	Production of computers, electronic and optical products	*H*	487 549.6	0.63	746 337.0	0.63
C27	Electrical Equipment Manufacturing	*MH*	192 017.9	0.25	321 467.8	0.27
C28	Production of machinery and equipment not included in other categories	*MH*	313 085.8	0.41	584 909.1	0.50
C29	Production of motor vehicles, trailers, and semi-trailers	*MH*	247 142.0	0.32	636 964.4	0.54
C30	Manufacture of other vehicles and equipment	*MH*	455 661.8	0.59	934 742.3	0.79
C31_C32	Production of furniture and other finished products	*L*	129 303.1	0.17	276 647.0	0.23
C33	Repair and installation of machinery and equipment	*ML*	363 799.3	0.47	634 244.2	0.54
D	Providing electricity, gas, and steam; air conditioning	*ML*	2 258 180.9	2.93	2 865 510.1	2.43
E	Water supply; water disposal, organization of waste collection and disposal, pollution control activities	*S*	379 347.9	0.49	656 924.6	0.56
F	Construction	*S*	4 899 595.6	6.36	5 963 811.1	5.07
G	Wholesale and retail trade; repair of vehicles and motorcycles	*S*	11 301 783.3	14.66	15 269 978.0	12.97
H	Transportation and storage	*S*	5 624 665.3	7.30	7 069 934.8	6.00

Code	Type of economic activity	Technological level identifier	2016		2021	
			GVA*, at current prices, million rubles	GVA %	GVA, at current prices, million rubles	GVA %
I	Activities of hotels and catering establishments	*S*	702 669.4	0.91	955 425.5	0.81
J	Activities in the field of information and communications	*HS*	1 953 446.3	2.53	3 235 412.9	2.75
K	Financial and insurance activities	*S*	3 398 322.0	4.41	5 383 927.1	4.57
L	Real estate activities	*S*	7 849 650.6	10.18	11 711 460.8	9.95
M	Professional, scientific, and technical activities	*HS*	3 431 789.1	4.45	5 255 975.4	4.46
N	Administrative activities and related additional services	*S*	1 865 711.6	2.42	2 214 231.1	1.88
O	Public administration and military security; social security	*S*	6 140 037.8	7.97	8 404 172.9	7.14
P	Education	*S*	2 442 864.9	3.17	3 723 555.7	3.16
Q	Activities in the field of health and social services	*S*	2 449 113.5	3.18	3 958 052.5	3.36
R	Activities in the fields of culture, sports, leisure, and entertainment	*S*	688 017.8	0.89	1 065 805.1	0.91
S	Provision of other types of services	*S*	457 379.0	0.59	626 549.3	0.53
T	Activities of households as employers; undifferentiated activities of private households in the production of goods and provision of services for their consumption	*S*	506 278.7	0.66	445 396.7	0.38
	TOTAL		**77 077 133.6**	**100**	**117 737 239.4**	**100**

** – GVA is Gross Value Added.*

Column 3 of Table 1 indicates the technological levels for each type of economic activity. To solve the problem of assigning each specific type of economic activity to a certain technological level, the statistical classification of economic activities in the European Community (NACE Rev. 2) was used. In NACE, by the recommendations of Eurostat and the OECD, industries related to high-tech, medium-high-tech, medium-low-tech, and low-tech types of economic activity are identified.

Based on the data in Table 1 types of economic activities are grouped by technological levels, and columns 3 and 4 of Table 2 present the share of goods and services of each technological level in the volume of production of goods and services in the Russian Federation for 2016 and 2021.

Similar calculations of the structure of production by technological levels were carried out for the national economies of the Republic of Belarus based on statistical data (Economic statistics, 2023) (Table 2. columns 5 and 6) and Kazakhstan based on statistical data (Official statistics, 2023) (Table 2. columns 7 and 8).

Table 2. Structure of production by technological levels in the Russian Federation, the Republic of Belarus, and Kazakhstan for 2016 and 2021

The technological level of production (NACE Rev. 2)	Technological level identifier	Share in production volume, %					
		Russian Federation		Republic of Belarus		Kazakhstan	
		2016	2021	2016	2021	2016	2021
1	2	3	4	5	6	7	8
High technology production	*H*	0.86	1.12	1.31	1.43	0.26	0.45
High-tech services	*HS*	6.99	7.21	8.80	11.33	7.48	6.40
Medium-high technology production	*MH*	2.59	3.50	6.90	7.77	0.96	1.73
Medium-low technology production	*ML*	9.31	10.50	9.78	8.17	9.35	10.61
Low technology production	*L*	17.06	20.38	18.48	19.13	21.66	23.68
Other (non-tech) services	*S*	63.19	57.29	54.75	52.17	60.31	57.14
Production of low backward technology	*B*	0.00	0.00	0.00	00.00	0.00	0.00
TOTAL		100.00	100.00	100.00	100.00	100.00	100.00

For the initial data used in computing the technological levels of consumption, we referred to the official data (Statistics, 2023), (Economic statistics, 2023), (Official statistics, 2023) on the volumes of retail trade in goods, as well as the volumes of services consumed by the population in the countries under examination.

We also categorized various groups of consumer goods and services based on their technological levels and determined the proportion of each group in the country's overall consumption. The technological level assigned to a consumer good was based on the technological level of the economic activity responsible for its production.

Table 3 displays the results of the calculations for the consumption structure classified according to technological levels in the national economies of the Russian Federation, the Republic of Belarus, and Kazakhstan.

Table 3. Structure of consumption by technological levels in the Russian Federation, the Republic of Belarus, and Kazakhstan for 2016 and 2021

The technological level of consumption (NACE Rev. 2)	Technological level identifier	Share in consumption volume, %					
		Russian Federation		Republic of Belarus		Kazakhstan	
		2016	2021	2016	2021	2016	2021
1	2	3	4	5	6	7	8
Consumption of goods created in high-technology production	H_c	4.21	5.26	4.30	5.11	7.65	7.92
Consumption of high-tech services	HS_c	0.00	0.00	0.01	0.00	0.05	0.02
Consumption of goods created in medium-high technology production	MH_c	6.10	10.05	10.25	10.74	15.16	17.38
Consumption of goods created in medium-low technology production	ML_c	7.10	8.66	10.28	10.49	18.41	16.88
Consumption of goods created in low-tech industries	L_c	58.25	55.20	52.38	47.61	45.57	46.68
Consumption of other (non-tech) services	S_c	23.78	20.33	22.35	25.70	11.82	10.15
Consumption of goods created in the production of backward technology	B_c	0.56	0.51	0.43	0.34	1.33	0.97
TOTAL		100.00	100.00	100.00	100.00	100.00	100.00

Further, utilizing the data provided in Table 3, indicators for the technological levels of production and consumption were computed using formulas 1 and 2. Table 4 presents the outcomes of calculations for the three countries.

Table 4. Indicators of the technological level of production and technological level of consumption in the Russian Federation, the Republic of Belarus, and Kazakhstan for 2016 and 2021

National economy	The technological level of production			The technological level of consumption		
	2016	2021	Growth rate, % (2021)/(2016)	2016	2021	Growth rate, % (2021)/(2016)
1	2	3	4	5	6	7
Russian Federation	3.38	3.42	101.18	3.31	3.44	103.93
Republic of Belarus	3.54	3.62	102.26	3.43	3.47	101.17
Kazakhstan	3.34	3.35	100.30	3.71	3.74	100.81

5 ANALYSIS OF PRODUCTION AND CONSUMPTION TECHNOLOGICAL LEVELS

5.1 Dynamics of production technological levels.

The results obtained allow us to state that at the beginning of the period under review in 2016 production technological levels of the three countries were approximately the same (Table 3. column 2). After five years, in 2021 the countries in question also have almost the same production technological level (Table 3. column 3). The Republic of Belarus is in the first place, its production technological level was 3.62. The Russian Federation is in second place with 3.42, and Kazakhstan is third with 3.35.

In the five years under review, none of the countries under consideration experienced a significant change in the production technological level. The maximum growth rate of the indicator occurred in the Republic of Belarus – 102.26%, followed by the Russian Federation – 101.18%, and Kazakhstan – 100.30%.

At the same time, it is necessary to pay attention to the fact that in all three countries, there was an increase in real GDP: in the Republic of Belarus by 109.0%, in the Russian Federation by 108.5%, in Kazakhstan by 115.2%. That is, the real volume of production increased significantly, but its technological structure changed slightly. This suggests that the main source of economic growth in the countries under consideration is not innovation. GDP growth occurs mainly not due to the transition to new techno-economic paradigms, but due to other factors. GDP growth is predominantly quantitative, not qualitative.

For comparison, according to (Bainev & Zhang, 2021), the level of technology in China, calculated using a similar methodology, was 4.1 in 2010, and 4.6 in 2018.

In a separately considered national economy, the volume of goods produced using technologies of higher techno-economic paradigms can grow in absolute terms. However, if there is no increase in the share of higher techno-economic paradigms relative to lower ones, then this indicates that there is a replication (scaling) of existing technological achievements, and there is no introduction of higher ones. At the same time, statistical reporting can create the illusion of innovative economic development.

5.2 Comparison of technological levels of production and consumption

As can be seen from column 6 of Table 4 in 2021 the countries under consideration have approximately the same technological level of consumption. Kazakhstan is in first place – 3.74. followed by the Republic of Belarus – 3.47 and the Russian Federation – 3.44.

Among the three countries under consideration, Kazakhstan has the most noticeable discrepancy between the technological level of consumption (3.74) and the technological level of production (3.45). The discrepancy is small, but it may indicate the emergence of a situation in the national economy of Kazakhstan in which the consumer-economic paradigm is ahead of the techno-economic paradigm.

This situation, with a certain degree of caution, can be explained by the fact that Kazakhstan, by world standards of innovative development, is a catching-up country, and at the same time has large reserves of raw materials and natural resources, which it exports in exchange for the import of high-tech consumer goods.

The development of this situation is dangerous for the national economy because the population's demand is "diverted" from consumer goods produced within the country to imported goods, which does not contribute to the development of production within Kazakhstan.

In the Republic of Belarus, the technological level of consumption is 3.47, while the technological level of production is 3.62, i.e., considering errors in the initial data and calculations, the levels are approximately equal.

This equality can be explained by the fact that the Republic of Belarus is a catching-up country in terms of the level of innovative development and, at the same time, does not have large reserves of raw materials and natural resources that could be exported in exchange for significant volumes of imports of high-tech consumer goods.

In the Russian Federation, the technological level of consumption is 3.44, while the technological level of production is 3.42, i.e., the levels are approximately equal.

In contrast to the Republic of Belarus, the Russian Federation has large reserves of raw materials and natural resources, which it exports and theoretically could purchase high-tech consumer goods in significant volumes in exchange for them. Why is it not observed that the technological level of consumption exceeds the technological level of production?

It can be assumed that the actual situation has developed partly under the influence of sanctions against the Russian Federation, because of which the import of high-tech goods into the country is limited. However, this issue requires more serious research, beyond the scope of this article.

6 CONCLUSIONS

The mechanism and results of the impact on economic growth of innovations in the field of production goods and innovations in the field of consumer goods are fundamentally different. A delay in the development of production innovation limits economic growth on the aggregate supply side, and a delay in the development of consumer innovation limits economic growth on the aggregate demand side.

In the modern theory of innovative development, the concept of techno-economic paradigms occupies a significant place. However, published research on this topic has not examined the role of consumer innovation separately from production innovation.

Nevertheless, innovative consumer goods play an independent role in economic growth and can be sold and consumed outside the corresponding techno-economic paradigm to which they belong.

One of the possible approaches to solving the problem of quantitative measurement of the production technological level and the consumption technological level is based on a system of periodization of technical and technological progress, which involves the identification of techno-economic paradigms.

Analysis of the dynamics of the technological levels of production and consumption, assessment of the degree of correspondence of the techno-economic and consumer-economic paradigms in the national economy, as well as analysis of the structure of production and consumption by technological levels allow to anticipate possible threats to the development of countries occupying a catching-up position in innovative development, as well as to anticipate the danger of a slowdown in economic growth for countries that are leaders in innovative development.

WORKS CITED

Bainev, V. F. (2020). *History of the economy of knowledge: technical, technological and political-economic analysis.* Minsk: Law and Economics.

Bainev, V., & Zhang, B. (2021). Industrial complex as a driver of technological development of the national economy. *Economic Science Today: Collection. Scientific Art.*, 49–60.

Baynev, V.F., Makarevich, S. V. (2023). Resource-utility approach to ensuring technological safety of the Republic of Belarus. *Science and Innovation*, 27–32.

Economic statistics. (2023, January 20). Retrieved from National Statistical Committee of the Republic of Belarus: http://dataportal.belstat.gov.by/Indicators/Search?code=1063065. – Access date: 12/20/2023

Glazyev, S. Y. (1990). *Leap into the future. Russia in the new world economic and technological structures.* Moscow: Economics.

Glazyev, S. Y. (1993). *Theory of long-term technical and economic development.* Moscow: Vladar.

Kondratiev, N. D. (2002). *Large cycles of conjuncture and the theory of foresight. Selected works.* Moscow: ZAO Publishing House “Economy”.

Lvov, D. S. (1990). *Effective management of technical development.* Moscow: Economics.

Lvov, D.S.; Glazyev, S.Yu. (1986). Theoretical and applied aspects of STP management. *Economics and Mathematical Methods*, 793–804.

Malkevich, N. D., Tikhomirov, I. N., & Zenchuk, N. F. (2003). *Interrelations in the development of the economy.* Gomel: BelSUT.

Official statistics. (2023, January 20). Retrieved from Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan: https://old.stat.gov.kz/official/industry/11/statistic/6. – Access date: 11/20/2023

Schumpeter, J. (1982). *Theory of economic development (study of entrepreneurial profit, capital, credit, interest, and business cycle).* Moscow: Progress.

Schumpeter, J. (2008). *Theory of economic development. Capitalism, socialism and democracy.* Moscow: Eksmo.

Statistics. (2023, January 20). Retrieved from Federal State Statistics Service: https://rosstat.gov.ru/statistic

Yakovets, Y. V. (1999). *Cycles. Crises. Forecasts.* Moscow: Nauka.

Zianchuk, M. (2023). Techno-economic and consumer-economic paradigms and their compliance. *Journal of the Belarusian State University. Economy*, 86-93.

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