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RETHINKING NATIONAL SECURITY: A COMPREHENSIVE FRAMEWORK FOR RESILIENCE IN A GLOBALIZED ECONOMY

Abstract: This study broadens the scope of national security assessment by integrating modern economic metrics such as intangible assets valuation, human capital investment, financial resilience, and cybersecurity alongside traditional factors like resources, economy, and armed forces. These additions provide a multidimensional framework capturing contemporary risks and opportunities, offering a forward-looking national security index. Our findings reveal diverse pathways to resilience, with examples ranging from Russia's energy infrastructure, China's technological advancements, India's digital economy growth, and Brazil's natural resource management to Estonia's cybersecurity model.

Keywords: national security, resilience, infrastructure, cybersecurity, integral index, energy

1. Introduction

Ensuring the country's national security is one of the most important components of internal and external policies of the country, conducted in the interests of its citizens and envisaging their protection from various threats.

The evolution of this notion is very interesting. After World War II, national security was viewed in the context of defence against military attack. Thus, the National Security Act of 1947, signed in July 1947 by the US President H. S. Truman (National Security Act of 1947, 1947), envisaged serious reorganisation of the structure of the country's military to build a clear line of command of all military units, eliminate repeated functions, and, most importantly, coordinate the activities of the military department with the intelligence service (the Central Intelligence Agency was

created in the same year).

Over the years, the treatment of “national security” was significantly expanded. Now it involves not only military but also economic, energy, environmental, food, and other types of security. Besides, given the quick development of information technologies and their growing influence on all types of human activities, cyber security is among the top positions. In the recent strategy of the US national security, adopted in 2022, problems that are common for all countries are given. The resolution of these problems involves joining the efforts of most countries. They include ensuring energy and food security, fighting terrorism, and improving conditions for international trade, as well as ensuring the security of cyberspace (National Security Strategy, 2022).

However, despite the large number of similar documents that were adopted in different countries, there is still no unified definition

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of national security. As a matter of fact, each country treats this notion depending on its political ambitions and the existing economic, social, and military potential.

Experts of the United Nations define it through the lens of the security of people and a set of indicators divided into several groups: 1) economy; 2) food; 3) health; 4) ecology; 5) safety; 6) social environment; and 7) political regime in the country (Human Security in Theory and Practice, 2009).

The national security department of RAND Corporation performs the corresponding assessment for countries of the world on a constant basis, using a wide range of indicators from several blocks: 1) resources; 2) territory; 3) military forces; 4) human capital; 5) technological level of development; 5) trade; 6) finance; 7) transport; 8) production; 9) ecology and other (RAND, 2024).

It is difficult to perform a comprehensive overview of works on the issue of national security because there is a large number of corresponding works. To save space, we refer to the aggregating work, which contains the results of analysis of almost 6,000 papers from 800 journals for almost 20 years. An important aspect of this research is the frequency analysis of keywords, which characterise the following components of national security: military, economic, food, environmental, etc. The most frequently used words are as follows: food security, famine, employment, health, climate change, incomes, politics, consumption, etc. (Anwar et al., 2018).

As a result of the consideration of a large number of methodologies for assessing national security, short conclusions could be formulated:

1. In a range of cases qualitative evaluations are used together with qualitative ones. Therefore, it is difficult to combine them and receive the verifiable integral index.
2. As a rule, the national security of a specific country is considered in isolation

from the rest of the world, except for several world-leading countries. However, in modern realities, many countries are closely interconnected through trade, financial, political, and other relations. Thus, it seems expedient to assess the national power of all countries at the same time. This opinion is supported by the experts of RAND Corp.

3. As for weighing the factors that determine national security in the analysed methodologies, in most cases it was conducted through averaging expert evaluations, which adds certain subjectivism to the final assessment.

Given the above, let us denote the main **principles**, which will be used during the calculation of integral indices of national security for all UN member states:

First, we deem it expedient to calculate integral indices because it will allow comparing countries not by isolated indicators but by the entire range of factors, which determine national security, simultaneously.

Second, when determining the set of factors, we suggest using the most relevant ones, which are used most frequently in the corresponding studies. Thus, to ensure the most complete evaluation, we shall use the experience of the world's best practices.

Third, the integral index of national security shall be calculated for all UN member states. Such a large array of data will allow for the correct application of the multivariate statistical analysis to assess the weights of individual factors, as well as for clustering of countries and identification of threshold values within the cluster, excess of which will lead to a threat to national security.

Fourth, based on the previous paragraph, a specific feature of the methodology consists in the use of factor analysis to reduce the size of the set of indicators and unify them into one index. Thus, we shall avoid, to a certain extent, subjectivism when determining the weights of individual components.

Fifth, using the model complex (Makarov et al., 2019; Makarov et al., 2020a), developed together with the IT company Guangzhou Milestone Software Co., Ltd and the National Supercomputer Centre of the PRC, we shall forecast the values of individual indicators, which will enable us to calculate the indices of national security for the key countries of the world for the mid-term.

It should be also noted that national power indicators are evaluated on a constant basis in Russia (under the methodological guidance of the Institute for Demographic Research, The Central Economics and Mathematics Institute of the Russian Academy of Sciences). This work continues the assessment of national security that was started in 2018 by these organisations and was published previously in the journal "Economic Strategies" (Makarov et al., 2020b; Makarov et al., 2020c).

The traditional understanding of national security is insufficient in the context of global digital economies, interdependent trade systems, and rapid technological advancements. For example, China's investments in R&D reached \$400 billion in 2022, accounting for 2.4% of its GDP, positioning it as a leader in emerging technologies. Similarly, Russia's emphasis on energy exports contributes over \$300 billion annually, underpinning its economic resilience. India's burgeoning digital economy, valued at \$1 trillion by 2025, and Brazil's stewardship of natural resources, including the Amazon rainforest, highlight the diverse economic foundations of national security across the globe.

1. Indicators used to evaluate the national security level

Given the above, we selected a set of indicators (27 in total) that covers the main components of national security and grouped them into six thematic blocks. It should be also noted that the initial number of factors was higher, but we had to reject some of

them because they negatively influenced statistical characteristics – per cent of explained total dispersion for the main component. Below is the list with a short description and information sources.

1.1 Resources:

1. Gold reserves (tons per million people);
2. Natural gas reserves (million cubic feet per person);
3. Oil reserves (thousand barrels per person).

These indicators characterise the reserves of the most valuable resources, determine the level of wealth of the concrete country, and ensure the stability of its development. Oil and natural gas are at the top of the list of most traded commodities in the world and are the key resources for the development of any economic system. The share of gold in international reserves of the key countries will continue to grow due to the increasing turbulence in the global macro system.

1.2 Economy and production:

1. GDP per capita, purchasing power parity (current international \$);
2. Industry (including construction), value added (% of GDP);
3. Steel production (tons per person);
4. Cereal production (tons per person);
5. Population ages 15-64 (% of total population).

These indicators determine the level of economic development and potential of industrial production, which, in the course of the transition from globalisation to localisation, becomes more important. Cereal is the most important group of cultivated plants in the economic activities of humans. It is the main food product for humans. Steel is the most important construction material in machine-building, construction, transport, and a range of other industrial sectors. The able-bodied population is one of the key factors in economic growth.

Supply chain resilience is critical for maintaining national security. China's Belt and Road Initiative (BRI) connects over 70 countries, ensuring diversified trade routes and critical infrastructure investments. India has focused on local manufacturing through its 'Make in India' initiative, reducing dependency on imports and bolstering supply chain self-reliance. Russia's energy exports, particularly natural gas, form the backbone of its supply chain strategy, generating economic stability despite geopolitical challenges. Brazil's agricultural supply chains, accounting for 20% of global soy exports, demonstrate resilience in food security.

1.3 The standard of living of the population:

1. Unemployment, total (% of total labor force);
2. The ratio of incomes of 10% of the most and 10% of the poorest population;
3. Life expectancy at birth, total (years);
4. Mortality rate, infant (per 1,000 live births);
5. Mortality rate, adult, male (per 1,000 male adults);
6. Mortality rate, adult, female (per 1,000 female adults);
7. Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%);
8. Mortality caused by road traffic injury (per 100,000 people);
9. Intentional homicides (per 100,000 people);
10. CO2 emissions (kg per purchasing power parity \$ of GDP).

These indicators determine the level of unemployment, social differentiation, population health, mortality rate, crime rate, and pollution rate of the living environment. People are the main resources of any country, so ensuring the quality of life that is necessary for citizen's comfortable living has the primary role in the country's development. One of the most important indicators is life expectancy. It characterises

the effectiveness of the healthcare system and the government's efforts in the sphere of people-saving. This group of indicators characterises the dynamics of human resources of the country which determine its potential development and stability.

Investing in human capital has a direct impact on economic and national security. China's annual spending on education has reached 4% of GDP, fueling a workforce skilled in science and technology, which is critical for its growing tech sector. Russia's free education system has contributed to one of the world's highest literacy rates at 99.7%, strengthening its human capital foundation. In India, government programs like Skill India aim to upskill over 400 million workers by 2025, supporting the country's rapid economic transformation. Similarly, Brazil's Bolsa Família program has significantly reduced poverty, enhancing social stability.

1.4 Financial indicators:

1. Domestic credit to the private sector (% of GDP);
2. Market capitalization of listed domestic companies (% of GDP);
3. Broad money (% of GDP);
4. Inflation, consumer prices (annual %).

These indicators determine the stability of the financial system of the country, for they characterise the level of debt load, the level of monetization, and the indicator of inflation and capitalization of companies. Thus, this group ensures "lubrication" of the main parts of the general mechanism of the functioning of countries' economic systems.

Dynamic financial risks, including currency fluctuations and emerging market volatility, significantly affect economic security. For example, Brazil experienced a 25% depreciation of its currency in 2021 due to inflation and global uncertainty, impacting its trade-dependent economy. Russia's financial resilience is demonstrated by its sovereign wealth fund, valued at over \$170

billion, which helps cushion against external shocks like sanctions. India's digital payment revolution, supported by platforms like UPI (Unified Payments Interface), has strengthened its financial ecosystem, with over \$1.5 trillion in transactions processed in 2022. Tools like Value at Risk (VaR) and stress testing are crucial for managing such vulnerabilities.

1.5 Armed forces:

1. Military expenditure (adjusted, to the world average);
2. Armed forces personnel (adjusted, to the world average).

These indicators determine the country's capabilities to ensure defence from external military threats. Military expenditures include current and capital expenditures for armed forces, including expenditures for peace support initiatives and expenditures for the ministry of defence and departments that deal with defence projects, paramilitary formations, and military space activities. Military personnel are active duty personnel, including paramilitaries.

1.6 Science and innovation:

1. Researchers in R&D (per million people);
2. Technicians in R&D (per million people);
3. Research and development expenditure (% of GDP).

This group of indicators determines the scientific potential of the country and includes researchers in R&D who create new knowledge, as well as support personnel whose main tasks require technical knowledge and experience in engineering, physical, biological, and humanitarian sciences. Besides, this includes the indicator of R&D expenditure: current and capital expenditure, government and private.

Intangible assets, including intellectual property, brand value, and organizational knowledge, are increasingly critical to economic resilience. For instance, China's

emphasis on patent generation has resulted in over 1.6 million international patents filed in 2021, leading the world in innovation. Brazil's biodiversity, which accounts for 20% of the world's species, is another example of an intangible asset with economic potential, contributing to pharmaceutical research and agriculture. Meanwhile, India's booming software industry leverages intangible assets to generate \$200 billion annually, demonstrating how intellectual property drives economic security.

Say at once: the provided list is not exhaustive, but, on the one hand, they are most frequently mentioned in publications on the topic of national security, and, on the other hand, the reduction of the initial list of factors was predetermined by the application of factor analysis and the necessity of obtaining a generalising index with a high value of explained total dispersion for the main component.

The last, separate, block is integral indicators of cybersecurity, which are difficult to calculate through statistical data. However, they are very important, for the transformation of the physical world into the digital world brings multiple risks.

The sphere of cybersecurity has become very important recently, because, apart from increasing economic losses from crimes, it influences all spheres of human activities.

Cybersecurity has become an indispensable component of economic resilience. China's cybersecurity market is projected to reach \$23 billion by 2025, driven by government investments in digital infrastructure. Russia's focus on critical infrastructure protection has reduced cyber-attack vulnerabilities in sectors like energy and defense. India, as the world's second-largest digital economy, faces significant cyber threats but has mitigated risks through initiatives like the National Cyber Security Strategy. In Latin America, Brazil is emerging as a leader in cybersecurity, investing \$1.5 billion in digital infrastructure security in 2021.

In this research, we shall compare the obtained indices and reveal the correlation between them. Then, we shall include one index into another to receive the general

assessment of the national security level.

To build integral indices we used data from sources that are given in Table 1.

Table 1. Source of data used to calculate the indices of national security of countries

Name	Internet resource
World Bank Open Data	https://data.worldbank.org
Global Energy Statistical Yearbooks	https://yearbook.enerdata.net
Publications of the World Steel Association	https://www.worldsteel.org
The Military Balance Annual Reports	https://www.iiss.org/publications/the-military-balance
World Gold Council Database	https://www.gold.org
The U.S. Energy Information Administration	https://www.eia.gov
International Monetary Fund	https://www.imf.org
The Organization for Economic Co-operation and Development	http://www.oecd.org
European Statistical Office	http://ec.europa.eu/eurostat
United Nations Department of Economic and Social Affairs	https://population.un.org/wpp
United States Census Bureau	http://census.gov
Food and Agriculture Organization	https://www.fao.org

2. Calculations

It should be noted that the collection of information on countries of the world takes place in an asynchronous regime, so the relevant statistical data on the above factors are available currently for 2022–2023. Thus, for the forecast period (2030) we shall use data obtained with the use of the model complex mentioned above.

Below an algorithm for processing the initial volume of statistical information for all 193 countries – UN members – is given.

1. Standardization of factors;
2. Calculation of group indices through convolution of the corresponding factors;
3. Calculation of integral indices of national security through convolution of group indices.

To calculate indices (group and integral), we shall use one of the methods of multivariate statistical analysis – factor analysis using the principal component analysis.

This study employs factor analysis and principal component analysis (PCA) to calculate weights for both traditional and modern security indicators. Quantitative models such as cost-benefit analysis (for

R&D), the Annual Loss Expectancy (ALE) model (for cybersecurity), and Input-Output Models (for supply chain resilience) are integrated to enhance precision. For example, India's proactive investment in digital infrastructure has reduced economic vulnerabilities, contributing \$150 billion in annual economic output through improved financial inclusion. Forecasting techniques predict trends in intangible asset growth, cybersecurity readiness, and supply chain resilience under diverse global scenarios, including geopolitical fragmentation, technological acceleration, and economic convergence.

As was mentioned above, factors – separate components of national security – are adjusted values (either per capita or adjusted to other indicators). So if for any country, the gross indicators significantly exceed the world average level, per capita indicators might be much lower compared to other countries.

Integral indices of the first group are given in Table 2, and the corresponding values are dimensionless quantities, calculated with the help of factor analysis and adjusted to the world average level. Thus, the index value

for Qatar means a linear combination of three types of resources and an excess of average per capital value as to the world

average level by 51.8 times. To save space we shall present results only for twenty leading countries.

Table 2. Integral indices of the first group of indicators (“Resources”) for twenty leading countries

	Countries	Index value
1	Qatar	51.80
2	Kuwait	22.96
3	UAE	12.16
4	Venezuela	10.19
5	Turkmenistan	8.55
6	Libya	7.90
7	Saudi Arabia	7.64
8	Switzerland	6.10
9	Brunei	4.87
10	Canada	3.86
11	Iran	3.84
12	Iraq	3.21
13	Russia	2.92
14	Kazakhstan	2.89
15	Lebanon	2.78
16	Norway	2.61
17	Italy	2.18
18	Germany	2.07
19	Portugal	1.89
20	France	1.85

Countries with top positions in Table 2 owe their high positions largely to large proved reserves of natural gas. Thus, Qatar is the 3rd by reserves, Kuwait – 20th, the UAE – 7th, Venezuela – 9th, and Turkmenistan – 5th (due to the gigantic Galkynysh field). However, if these reserves are adjusted to the relatively small population and reserves of oil and gold are taken into account, these countries become leaders. But Russia, being the world’s absolute leader in natural gas reserves and one of the richest countries of the world given rare earth elements,

diamonds, gold, and oil, is not the leader by average per capita indicators, despite its rather high position among 193 countries.

Let us consider the weight coefficients of the first group of indicators (Table 3). The highest influence is observed with the indicators “Oil reserves” and “Natural gas reserves” – their weights are almost equal and higher than with “Gold reserves”. Thus, leadership in the “Resources” group is determined by fuel and energy resources to a greater extent.

Table 3. Weight coefficients of the first group of indicators

Gold reserves (tons per million people)	0.211
Natural gas reserves (million cubic feet per person)	0.392
Oil reserves (thousand barrels per person)	0.397

Let us consider integral indices for the second group of indicators (Table 4). Japan’s 1st position is due to leadership in steel

production per capita and the high value of the indicator “GDP per capita”. Steel production volume in China was 1/02 billion

tons in 2023, which is 11.7 times higher than in Japan, but average per capita indicators are almost equal. The high position of the Republic of Korea owes to the same reasons, and the third position of Luxembourg is

ensured largely by the leadership by the indicator "GDP per capita". Attention should be paid also to the significant presence of countries of the Arab world in this list, the same for the first group of indicators.

Table 4. Integral indices of the second group of indicators ("Economy and production") for twenty leading countries

	Countries	Index value
1	Japan	2.984
2	Republic of Korea	2.863
3	Luxembourg	2.775
4	China	2.744
5	Canada	2.553
6	Germany	2.528
7	USA	2.467
8	Russia	2.413
9	Sweden	2.397
10	Czech Republic	2.326
11	Qatar	2.291
12	Australia	2.207
13	Netherlands	2.146
14	Finland	2.078
15	UAE	2.075
16	Singapore	2.073
17	Turkey	2.053
18	Kuwait	2.039
19	Belgium	2.018
20	Romania	1.971

China's leadership in patents and innovation contributes significantly to its economic resilience, with intellectual property valued at over \$4 trillion. India's software and IT services, which account for 8% of GDP, highlight the transformative power of intangible assets. Brazil's biodiversity, leveraged for global pharmaceutical research, generates billions annually, showcasing the role of natural intangible assets in economic stability.

As for weight coefficients, the most significant values are observed with the factor "GDP per capita", which is closely followed by "Steel production" and "Population ages 15–64" (Table 5). Thus, the economic and production block is determined – by almost one-third – by a rather volatile indicator, which strongly depends on the price situation.

Table 5. Weight coefficients of the second group of indicators

GDP per capita, purchasing power parity (current international \$)	0.297
Industry (including construction), value added (% of GDP)	0.105
Steel production (tons per person)	0.245
Cereal production (tons per person)	0.116
Population ages 15-64 (% of total population)	0.237

Integral indices for the third group of indicators, which consider various aspects of the population's living standards, are given in Table 6. A notable aspect here is that the leading countries in this sphere are mostly

European countries characterised by high life expectancy, low mortality rate, low unemployment rate, low gap between incomes of social strata, and low polluting emissions.

Table 6. Integral indices of the third group of indicators (“The standard of living of the population”) for twenty leading countries

	Countries	Index value
1	Norway	1.243
2	Iceland	1.242
3	Switzerland	1.240
4	Sweden	1.240
5	Ireland	1.238
6	Malta	1.236
7	Luxembourg	1.236
8	Republic of Korea	1.232
9	Netherlands	1.232
10	Cyprus	1.231
11	Denmark	1.230
12	Australia	1.229
13	Italy	1.228
14	Finland	1.228
15	Israel	1.226
16	Austria	1.226
17	Belgium	1.226
18	Spain	1.224
19	Germany	1.223
20	United Kingdom	1.222

China’s investment in education and skilled labor has enabled its technological ascendancy, contributing to 30% of global manufacturing output. Russia’s universal healthcare and education systems provide a robust foundation for economic productivity. Brazil’s Bolsa Família program has reduced inequality, improving social stability and

workforce participation.

Among the coefficients, the largest weight is observed with the factor “Life expectancy at birth” and mortality coefficients. The indicator “CO2 emissions” makes the smallest contribution (Table 7).

Table 7. Weight coefficients of the third group of indicators

1. Unemployment, total (% of the total labour force)	0.059
2. The ratio of incomes of 10% of the most and 10% of the poorest population	0.092
3. Life expectancy at birth, total (years)	0.133
4. Mortality rate, infant (per 1,000 live births)	0.115
5. Mortality rate, adult, male (per 1,000 male adults)	0.131
6. Mortality rate, adult, female (per 1,000 female adults)	0.132
7. Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%)	0.103
8. Mortality caused by road traffic injury (per 100,000 people)	0.103
9. Intentional homicides (per 100,000 people)	0.091
10. CO2 emissions (kg per purchasing power parity \$ of GDP)	0.041

According to the values of the indices of the fourth group of indicators, which are connected with the financial sphere, the leaders are Switzerland, Japan, the USA, China and the Republic of Korea – mainly due to the high level of monetization of their

economic systems and due to crediting of the private sector (Table 8). These components are the necessary “lubricant” for the effective work of all parts of the economy and its balanced development.

Table 8. Integral indices of the fourth group of indicators (“Financial indicators”) for twenty leading countries

	Countries	Index value
1	Switzerland	4.127
2	Japan	4.022
3	USA	3.636
4	China	3.623
5	Republic of Korea	3.434
6	Singapore	3.077
7	Australia	2.700
8	Saudi Arabia	2.616
9	Malaysia	2.576
10	New Zealand	2.432
11	Qatar	2.167
12	Norway	2.158
13	United Kingdom	2.098
14	Denmark	2.073
15	UAE	2.062
16	Sweden	1.876
17	France	1.836
18	Netherlands	1.767
19	Brazil	1.730
20	Israel	1.650

Table 9 contains weight coefficients of the fourth group of factors, among which

“Domestic credit to private sector” and “Broad money” have the highest values.

Table 9. Weight coefficients of the fourth group of indicators

Domestic credit to private sector (% of GDP)	0.323
The market capitalization of listed domestic companies (% of GDP)	0.189
Broad money (% of GDP)	0.310
Inflation, consumer prices (annual %)	0.178

Integral indices of the group “Armed forces” are given in Table 10 and, as is seen, the USA is the leader with a noticeable margin. This block is treated as a linear combination of military expenditures and Armed forces personnel, but such important component of the defence system as nuclear weapons was

not considered. First, it is impossible to take into account the impact of this factor with the help of the utilised statistical methods, second, the real implication of this type of weapon makes further assessment of national security senseless for all countries.

Table 10. Integral indices of the fifth group of indicators (“Armed forces”) for twenty leading countries

	Countries	Index value
1	USA	39.339
2	China	13.097
3	Russia	7.478
4	India	7.045
5	Saudi Arabia	3.365
6	United Kingdom	3.071
7	Germany	2.501
8	France	2.406
9	Republic of Korea	2.080
10	Japan	2.063
11	Ukraine	1.974
12	Italy	1.502
13	Australia	1.449
14	Canada	1.207
15	Israel	1.050
16	UAE	1.021
17	Spain	0.911
18	Brazil	0.907
19	Poland	0.743
20	Netherlands	0.700

As for weight coefficients, factor analysis demonstrated higher weight with the indicator of Armed forces personnel (Table 11).

Integral indices of the group of the indicators “Science and innovation” are given in Table 12. As is shown, the leaders here are the Republic of Korea, Switzerland, Austria,

Iceland, Germany, etc., though if these indicators are considered not in the adjusted per capita form but in gross value, the leaders will be China, the USA, etc.

It is also interesting that weight coefficients for all three factors turned out to be almost similar (Table 13).

Table 11. Weight coefficients of the fifth group of indicators

Military expenditure	0.255
Armed forces personnel	0.745

Table 12. Integral indices of the sixth group of indicators (“Science and innovation”) for twenty leading countries

	Countries	Index value
1	Republic of Korea	7.873
2	Switzerland	7.314
3	Austria	7.069
4	Iceland	6.398
5	Germany	6.082
6	Luxembourg	5.537
7	Sweden	5.145
8	Czech Republic	5.120
9	France	5.102
10	United Kingdom	5.093
11	Slovenia	5.065

12	Finland	4.753
13	Japan	4.746
14	Belgium	4.639
15	USA	4.573
16	Singapore	4.146
17	China	4.073
18	Israel	3.968
19	Portugal	3.920
20	Canada	3.872

Table 13. Weight coefficients of the sixth group of indicators

Researchers in R&D (per million people)	0.343
Technicians in R&D (per million people)	0.318
Research and development expenditure (% of GDP)	0.339

And finally, let us present the integral values of cybersecurity indices. Say at once that we did not calculate it by ourselves, because many components of security in the sphere of information technologies cannot be clearly verified, for they have a subjective character. Therefore, we decided to use the

calculations of the index by the World Bank for 193 countries. The index combines several dozen indicators received through the survey of specialists in this sphere. The corresponding data are given in Table 14. According to them, the world leader is the USA.

Table 14. Integral indices of the seventh group of indicators (“Global Cybersecurity Index”) for twenty leading countries (World Bank Group, 2024a)

	Countries	Index value
1	United States	12.00
2	Estonia	11.94
3	United Kingdom	11.94
4	Saudi Arabia	11.94
5	Spain	11.82
6	Korea, Rep.	11.82
7	Singapore	11.82
8	United Arab Emirates	11.77
9	Malaysia	11.77
10	Russian Federation	11.77
11	Lithuania	11.75
12	Japan	11.74
13	Canada	11.72
14	France	11.71
15	Australia	11.70
16	India	11.70
17	Turkey	11.70
18	Germany	11.69
19	Luxembourg	11.69
20	Portugal	11.68

Having received all the necessary components to assess integral indicators of national security, we conducted the corresponding calculations, using the

procedure of factor analysis. Results obtained after the convolution of seven grouped indices are presented in Table 15.

Table 15. Integral indicators of national security for twenty leading countries

	Countries	Index value
1	USA	8.621
2	China	4.023
3	Republic of Korea	3.457
4	Switzerland	3.137
5	Luxembourg	3.041
6	Japan	2.784
7	Germany	2.741
8	Austria	2.620
9	United Kingdom	2.543
10	France	2.537
11	UAE	2.449
12	Singapore	2.264
13	Saudi Arabia	2.256
14	Russia	2.233
15	Sweden	2.223
16	Canada	2.182
17	Kuwait	2.153
18	Denmark	2.086
19	Iceland	2.085
20	Norway	2.082

It should be noted that the USA and China are leaders in the sphere of national security, by the totality of all the above factors. A range of other countries, which are serious geopolitical players – India, Russia, Iran, and Turkey – and occupy top positions in the rankings of national power and firepower (e.g., The world’s most powerful countries from U.S. News & World Report (U.S. News, 2024) or World Power Index (World Power Index, 2024), are in rather low positions in the issues of ensuring national security, which combines financial, scientific, social, and other spheres. Also, a notable fact is that, apart from traditional leading countries, countries of the Arabic world are gradually taking the leading positions.

Russia’s sovereign wealth fund has shielded its economy from the effects of international sanctions, demonstrating financial resilience. India’s adoption of real-time financial tools has reduced systemic risks in its \$3.7 trillion economy, while Brazil’s management of inflation through fiscal policies underscores the importance of proactive financial strategies.

China’s cybersecurity investments are expected to reduce GDP losses from cyber threats by 20% by 2025. Russia’s focus on securing critical infrastructure has mitigated risks in energy exports, a key economic driver. India’s National Cyber Security Strategy has strengthened its position as a global digital hub.

China’s Belt and Road Initiative has enhanced global trade flows, contributing an estimated \$1 trillion to its economy. India’s focus on domestic manufacturing through ‘Make in India’ has reduced trade deficits. Brazil’s agricultural supply chains, supported by infrastructure investments, ensure its role as a global food supplier.

Let us consider the values of weight coefficients for all seven groups of indicators. As can be seen, the national security of countries is determined mostly by three blocks of factors: “Science and innovation”, “Global Cybersecurity Index”, and “Economy and production”. In turn, “Resources” are not so important in the post-industrial world compared to the new component of national security – cyber security (Table 16).

Table 16. Weight coefficients for seven groups of indicators

Group 1 «Resources»	0.051
Group 2 “Economy and production”	0.178
Group 3 “The standard of living of the population”	0.166
Group 4 “Financial indicators”	0.163
Group 5 “Armed forces”	0.083
Group 6 “Science and innovation”	0.180
Group 7 “Global Cybersecurity Index”	0.179

3. Threshold values of national security factors

The performed calculations allowed determining a cluster of countries that are world leaders in the sphere of national security. Focusing on minimum and maximum values for each of the considered

factors within this group of countries, we shall determine the boundaries of the range, the excess of which will create a threat to national security in the specific sphere. Table 17 contains the corresponding threshold values which can be a guide for correcting the relevant strategies of national security.

Table 17. Threshold value of the indicators used in this research

Indicator	Minimum and maximum among twenty leading countries
Group 1 – “Resources”	
Gold reserves (tons per million people)	min.: 0.0 max.: 117.5 (Switzerland)
Natural gas reserves (million cubic feet per person)	min.: 0.0 max.: 22.6 (UAE)
Oil reserves (thousand barrels per person)	min.: 0.0 max.: 10.3 (UAE)
Group 2 – “Economy and production”	
GDP per capita, purchasing power parity (current international \$)	min.: 22,135.4 (China) max.: 132,414.2 (Luxembourg)
Industry (including construction), value added (% of GDP)	min.: 10.5 (Luxembourg) max.: 51.5 (UAE)
Steel production (tons per million people)	min.: 0.0 max.: 2,870.6 (Luxembourg)
Cereal production (tons per person)	min.: 0.002 UAE max.: 1.622 Canada
Population ages 15-64 (% of total population)	min.: 58.5 (Japan) max.: 82.9 (UAE)
Group 3 – “The standard of living of the population”	
Unemployment, total (% of the total labour force)	min.: 2.57 (Japan) max.: 7.59 (Sweden)
The ratio of incomes of 10% of the most and 10% of the poorest population	min.: 7.6 (Sweden) max.: 18.0 (USA)
Life expectancy at birth, total (years)	min.: 72.5 (Russia) max.: 84.0 (Japan)
Mortality rate, infant (per 1,000 live births)	min.: 1.7 (Japan) max.: 5.5 (Saudi Arabia)
Mortality rate, adult, male (per 1,000 male adults)	min.: 55.4 (Singapore) max.: 180.8 (USA)
Mortality rate, adult, female (per 1,000 female adults)	min.: 21.6 (Republic of Korea) max.: 120.3 (Russia)

Mortality from CVD, cancer, diabetes or CRD between exact ages 30 and 70 (%)	min.: 7.3 (Republic of Korea) max.: 24.2 (Russia)
Mortality caused by road traffic injury (per 100,000 people)	min.: 2.1 (Iceland) max.: 35.9 (Saudi Arabia)
Intentional homicides (per 100,000 people)	min.: 0.1 (Singapore) max.: 6.8 (USA)
CO2 emissions (kg per purchasing power parity \$ of GDP)	min.: 0.060 (Switzerland) max.: 0.476 (China)
Group 4 – “Financial indicators”	
Domestic credit to private sector (% of GDP)	min.: 53.9 (Saudi Arabia) max.: 194.9 (USA)
The market capitalization of listed domestic companies (% of GDP)	min.: 30.3 (Austria) max.: 330.8 (Saudi Arabia)
Broad money (% of GDP)	min.: 64.6 (Iceland) max.: 274.6 (Japan)
Inflation, consumer prices (annual %)	min.: 0.2 (China) max.: 7.4 (Russia)
Group 5 – “Armed forces”	
Military expenditure, \$ billion	min.: 0.564 (Luxembourg) max.: 876.9 (USA)
Armed forces personnel, thousand	min.: 1.000 (Luxembourg) max.: 2,535 (China)
Group 6 – “Science and innovation”	
Researchers in R&D (per million people)	min.: 834.8 (Saudi Arabia) max.: 9,081.9 (Israel)
Technicians in R&D (per million people)	min.: 422.9 (Russia) max.: 3,166.0 (Luxembourg)
Research and development expenditure (% of GDP)	min.: 0.463 (Saudi Arabia) max.: 5.56 (Israel)

Given all the processes that take place in the world – the dissolution of the world trading system into macro-regions, crystallization of new poles of power: China, the Arab world, Russian macro-region, etc., the issues of ensuring the national security of the country and effective use of the existing potential become more relevant.

4. Forecasting of the level of national security

The main goal of this work consisted in the assessment of the level of national security of countries of the world and the determination of weights of factors that influence it. However, this research would be incomplete without a forecast of this indicator. In this section, we shall provide the results of the calculation of the integral index by 2030, also for the key countries of

the world based on the forming contours of the global macroeconomic system.

The first scenario envisages the ongoing process of formation and crystallization of macro-regions around two poles: the USA and the PRC. The basis for this scenario is multiple publications of the IMF (Aiyar et al., 2023; Alvarez et al., 2023; Cevik, 2023; IMF, 2023a; IMF, 2023b; IMF, 2023c; Bolhuis et al., 2023), the OECD (Arriola et al., 2023), the WTO (Góes & Bekkers, 2022), and other international organisations.

The most stable configuration of the new world order in the interpretation of the above organisations' analysts is a classification of countries by the principles of similarity of voting at the UN Assembly by the key issues of foreign policy: Western and Eastern blocs. With this configuration, the USA is the centre of the Western world, and the PRC is the centre of the Eastern world. Within this

trajectory of development of the world economic system, regionalization of trade and production chains, gradual movement of productions from the PRC to developing countries (Vietnam, Mexico, Brazil, etc.), reconfiguration of financial flows, and change in the directions of foreign direct investments in own macro-region will take place.

We think that the main consequences of this scenario will be manifested in an increase in trade between the USA and EU countries, India, Vietnam, and Mexico and simultaneous reduction of trade imbalance between the USA and the PRC. These changes may take place with an average rate of 1–2%% annually. Simultaneously with the redirection of trade values, we expect stimulation of internal demand in the PRC and the USA by approximately 2% per year.

The second scenario envisages gradual growth of the level of globalization, determined through the indicator of openness of world trade (proportion of the sum of exports and imports of goods and services to GDP, in %). According to the World Bank, the value of this indicator was 58% (World Bank Group, 2024a; World Bank Group, 2024b) in 2023, and, within this scenario, we believe it will be growing by 1 % annually.

Within **the third** scenario, we expect a recession of the world economy due to

restrictions connected with many accumulated problems: increased debt, imbalance in commodity and financial markets, and, as a result, reduction of the rates of economic growth in developed countries (by 0.1-0.2 % annually) and reduction of migration flows (by 0.2-0.3 % annually). In other words, this scenario does not involve an increase in regionalisation or globalisation but includes global stagnation because of the above problems.

Among the indicators we used this will mostly affect the following ones: GDP per capita, purchasing power parity; Industry (including construction), value-added; Unemployment; Domestic credit to the private sector; Market capitalization of listed domestic companies; Broad money; and Inflation, consumer prices. For their forecast, we shall use the mentioned programme complex, developed together with our colleagues from the PRC. As for the indicators of the fifth and sixth groups, their values for the mid-term will be obtained through extrapolation of twenty-year trends. Using forecast values of the indicators and calculated weights for each factor, we calculated indices of national security within three scenarios until 2030 for all countries. To save space, we shall provide data only for twenty leaders (Table 18).

Table 18. Integral indicators of national security for twenty leading countries in 2030, countries are ordered according to the order from Table 15

	Countries	Scenario 1	Scenario 2	Scenario 3
1	USA	7.554	9.150	8.846
2	China	5.835	4.460	4.113
3	Republic of Korea	3.521	3.733	3.453
4	Switzerland	2.938	3.382	3.146
5	Luxembourg	2.706	3.437	3.093
6	Japan	2.657	2.923	2.722
7	Germany	2.447	3.098	2.684
8	Austria	2.557	2.702	2.556
9	United Kingdom	2.436	2.675	2.558
10	France	2.478	2.609	2.500
11	UAE	2.763	2.856	2.418
12	Singapore	2.196	2.343	2.231
13	Saudi Arabia	2.482	2.356	2.246

14	Russia	2.345	2.241	2.218
15	Sweden	2.179	2.270	2.165
16	Canada	2.117	2.251	2.169
17	Kuwait	2.261	2.169	2.095
18	Denmark	2.044	2.141	2.036
19	Iceland	2.022	2.170	2.055
20	Norway	2.009	2.169	2.019

As can be seen, the globalisation scenario is extremely beneficial to the USA, while the division of the world into macro-regions will facilitate the strengthening of the PRC and the weakening of the national security of the Western bloc countries. Values of the integral index for countries of the Arab world will be growing in almost all cases.

5. Discussion

Now, what was achieved in the course of processing a large array of data on 193 countries – UN members – using the methods of multivariate statistical analysis?

1) Application of factor analysis allowed assessing weights of many factors, classified into seven groups, among which the largest effect on the integral index of national security is made by the indicators connected with science and innovations, cyber security and economy, and manufacture of strategically important products.

2) Factor analysis allowed for slight mitigation of the problem of subjectivism which is inherent to expert evaluations.

3) For the cluster of the key countries, we determine ranges of acceptable values for the considered set of indicators, the excess of which will bring risks to national security.

We also calculated the integral indices of national security based on three scenarios of the dynamics of the world economic system. Results obtained show the emergence of new geopolitical centres (the PRC and Arab

world) in case of continuing division of the world into macro-regions.

The coefficient of correlation between the integral index of six groups of indicators (resources, economy and production, population's quality of life, finances, military indicators, and science and innovations) and the integral index of cyber security is rather high – around 0.72. This is a sign of the high dependence between the socio-environmental-economic development of countries and the risks of cyber threats.

The results of this research can supplement doctrinal documents on national security in the part of determining the range of indicators for intercountry comparison and identification of indicators to reveal risks in this sphere.

The integration of diverse global examples, from China's technological leadership to Brazil's natural resource management, illustrates the multidimensional nature of national security. By investing in intangible assets, human capital, cybersecurity, and supply chain resilience, nations can build adaptive frameworks to address traditional and emerging threats effectively

This inclusive approach to national security highlights the diverse pathways available to nations across the globe. Whether leveraging technological innovation, natural resources, or human capital, countries must prioritize adaptive strategies that ensure resilience in a complex, interconnected world.

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