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SOLVING ECONOMIC SECURITY ISSUES IN THE COORDINATE SYSTEM OF MODERN RISKS AND THREATS

KHARLAMOVA Ganna

Taras Shevchenko National University of Kyiv, Faculty of Economics, Kyiv, Ukraine

STAVYTSKYY Andriy

Taras Shevchenko National University of Kyiv, Faculty of Economics, Kyiv, Ukraine

FEDORENKO Iryna

Taras Shevchenko National University of Kyiv, Faculty of Economics, Kyiv, Ukraine

Abstract:

In today's globalized world, the challenge of the state economic security ensuring is particularly relevant as a priority for the national interests protection from various threats. The analyses of the experience of the European Union and other countries revealed that national economic security ensuring plays a crucial role in securing for the state its geostrategic significance and potential. The article provides a critical analysis of modern threats and risks to economic security from the geostrategic perspective. The paper develops the methodology of the economic security index calculating based on a unified comparison of parameters of economic and social development of all countries, which allowed to move away from signaling approaches and eliminated subjectivity in assessments and following policy recommendations. In contrast to existing methods, the authors' approach uses geopolitical factors. This tactic allowed taking into account the directions of change in the world and identifying external threats and risks to state economic security. The analysis and comparison of the index of economic security of European countries based on the offered concept are carried out. The countries are clustered based on the economic security index.

Key words: clustering, index, Europe, economic security, globalization

1. Introduction

The concept of economic security should be formed taking into account a variety of factors, internal and external conditions that impact the dynamics of the national economy, its ability to support the society, state, and an individual, to ensure state competitiveness as external as well internal. Economic security is ensured, above all, by the efficiency of the economy itself. It must be consistent with the whole system of state bodies and each economic sector. The experience of the European Union (A common vision, a joint action: a stronger Europe, 2016) shows that ensuring national economic security in today's globalized world plays a crucial role in securing for the state a place

among other countries that would correspond to its geostrategic significance and potential. Therefore, most EU countries in their national doctrines consider strengthening the European space through the development of European integration and the active policy of the European Union's neighborhood with Eastern Europe, South Caucasus, Central Asia, and the Mediterranean region as the principal task of economic security policy. The ultimate goal of ensuring economic security in the EU is to form a fully integrated Europe with the same standard of living in all member states.

In the context of strengthening the socio-economic cohesion of the EU member states, the Lisbon Strategy plays an important role. EU member states have a significantly positive experience in implementing European integration strategies at the regional level. Thus, self-governing bodies have a rich arsenal of tools and levers of economic, legal, and financial influence to defend regional interests and ensure the socio-economic security of territories.

However, despite the declared commonality of actions, EU countries and the world as a whole do not have a unified approach either to understanding the definition of economic security or to list the main threats and challenges facing it, or to a methodology for tracking its dynamics - strengthening or weakening. Therefore, this article aims to close this research gap, which, accordingly, forms its novelty. The paper's logic is to develop an adequate and effective index of economic security assessment, which would take into account both the capabilities of the existing statistical base and current key challenges and threats to economic security. Thus, the logic of the article traces the disclosure of the problem according to the following scheme: a geostrategic review of existing regulatory approaches to assessing economic security in different countries, focusing on EU countries, development of a methodological basis for calculating the economic security index, the review of trends in some considered countries, and clustering countries according to this index to identify similarities and commons at the interstate level. The article concludes with a discussion of possible bottlenecks in the approach and presents the conclusions.

2. Literature review

The concept of EU economic security must be seen in the context of the economic security of each EU member state. Thus, Germany's active role in Western European integration processes largely determines the concept of its economic security. Same as the socio-political situation in Central and Eastern Europe, which is part of the EU, directly affects the economic security of Germany, which is the main financial donor in the EU. Therefore, Germany is more interested than any other country in ensuring the economic security issues of all EU member states. In Germany, the sustained financial security of the state is considered equivalent to maintaining the stability of economic growth. The country's main provisions in the field of national security, including financial security, are set out in an official directive of the Ministry of Defense, which states that the German government sees the process of ensuring financial security in support of social and economic progress, protection from economic blackmail, democratization in Europe and

worldwide, ensuring freedom of trade, access to raw materials and markets within a common global economic and financial system.

Without significant reserves of raw materials, Germany is one of the largest consumers of imported raw materials in the world (Bachmeier & Griffin, 2006). Moreover, its dependence on raw materials from other countries is not considered by the government as a threat to economic security. This is happening at a time when access to natural resources is one of the key factors influencing the international field (BP, 2030).

The Law "On Supporting the Stability and Growth of the German Economy" (German Stability Programme 2020 - European Commission, 2020) is one of the key tools for state economic security ensuring. According to the normative document, the state must ensure the implementation of such economic policy, which would, within the chosen model of market economy, promote simultaneous price stability, high employment, and economic equilibrium at a constant rate of economic growth.

However, in Germany, as in the vast majority of EU countries, the main emphasis in the process of ensuring economic security is not on their capabilities, but on general European (within the EU) security. For example, the above-mentioned directive of the German Ministry of Defense states: "the problems of our world can best be resolved through international discussion and compromise, so German security policy focuses on international relations and national institutions".

As to France, ensuring national economic security is considered within the concept of national defense (Security, Disarmament and Non-proliferation, 2020). Therefore, instead of the term "economic security", the term "economic defense" is used. The foundations of the concept of economic security in France were laid with the adoption of the National Security Act, where the main feature of the French economic security strategy was the consideration of national enterprises as a key object of economic security. In the second half of the 1990s, France revised its previous approaches to the nature and ways to strengthen its economic security and identified the following areas of its provision: protection of tangible and intangible assets of French enterprises, including their physical protection, intellectual property protection and security information systems used by national companies; control over the strategic vulnerability of the country, including monitoring of those areas where national enterprises are significantly inferior to foreign competitors; prevention of economic crises caused by disruptions in the functioning of basic infrastructures serving the country's economy: energy, transport, financial and banking, telecommunications, etc.

The new strategy focuses on the information security of French companies, which is considered a key factor for success in a highly competitive market environment. In this context, the state undertakes the provision of economic entities with accurate, complete, and reliable economic information. A two-tier system has been set up in France to monitor the state of economic security. The Ministry of Economy, Finance and Industry has set up a special department, which is responsible for coordinating work to ensure economic security, including the organization of protection of industrial, transport, financial, and telecommunication infrastructures of the country, collecting and processing data on the state of the economy within the access of French enterprises to relevant and timely economic information. At the regional level, attempts to ensure economic security are

carried out through departments established at the territorial offices of the Treasury with the involvement of customs services.

The UK's economic security policy is geared to protecting national economic interests and has traditionally relied on private business to support it at the maximum level. Threats to economic security are divided into internal and external. They are ranked according to the grade of importance and likelihood of occurrence. That allows concentrating efforts on eliminating the most hazardous risks to the national economic security. The United Kingdom has established an effective system of economic security based on an extensive network of institutions that ensure the interaction of all three main system bodies - parliament, government, and business - in the development and implementation of decisions in the ground of national economic security. Such influential institutions include, inter alia, the Confederation of British Industry, the Eastern European Trade Council, and other more specialized organizations representing the interests of entrepreneurs.

Spain has also developed an effective system of economic security, characterized by a flexible regulatory framework, a clear division of competencies of ministries, departments, and organizations to implement regulations of economic development and the functioning of public control services in the economy. One of the important components of the national economic interests protection policy in Spain is the Law "On improvement and protection of national industry". It identifies sectors of the economy that have national priority and fall under the policy of state protectionist measures for state-owned enterprises. This also creates a clear system for attracting foreign technology. At various stages of the country's development, priority programs are approved in the form of laws, which regulated investment promotion procedures and create flexible protective barriers that are reduced or eliminated in the right directions. Spain also has a Law on foreign investment, which defined areas where foreign capital was virtually barred (defense facilities, the media), sectors of the economy with limited access to foreign capital (tourism, banking, strategic industries), and open industries (the production of food and consumer goods, including the automotive industry).

Italy pays considerable care to foreign economic expansion, which is carried out over economic and industrial dependence on its foreign partners (Marco & Gabriele, 2019). Priority areas for strengthening Italian economic security include increasing its existence abroad through the expansion of international industrial cooperation, shielding the interests of its producers in domestic and foreign markets in the outline of state international obligations (connected to participation in political and economic associations), and as well as in Germany, the divergence of energy suppliers.

An analysis of Western European countries (such as the Netherlands, Belgium, Denmark, Luxembourg, and Switzerland) experience in economic security ensuring shows that their main strategic goal in protecting state economic interests is to ensure sustainable economic growth and modernization in a competitive environment. These countries do not have the opportunity to significantly influence the formation of the structure of the world economy and therefore are forced to adapt to the conditions of the world economy (Gryshova, 2020; Bogoslov & Stoica, 2019).

The economic security policy of the Czech Republic, Poland, Slovakia, and the Baltic States is defined by relevant national security documents (strategies, concepts) and is grounded on the conjunction of national interests with European interests in the context of European integration, as well as political, economic, and institutional transformation. The main dangers to the economic security of this group of states are the economic backwardness of the regions of Central Europe from Western European countries, the difficulties of transition to a market economy, the problem of forming democratic and market institutions (Gebaska, 2021).

Summing up, the main guidelines to ensure economic security in the new EU member states are defined in their national security strategies. Among them are the following:

- implementation of effective macroeconomic stabilization measures;
- support of internal and external stability;
- ensuring the dynamic development of the economy and international cooperation;
- accelerating structural reforms in the economy;
- creating a private sector, attracting foreign investment, and supporting small and medium-sized businesses;
- fight against organized financial and economic crime;
- effective market regulation in the economic and financial spheres;
- harmonization of financial and economic legislation, financial, economic, and customs policy with the European one, etc.

The most cost-effective is the economic security systems of Great Britain, Germany, France, Italy, and Spain. The state policy of these countries is focused on improving the efficiency of the national economy while maintaining strong economic security. The new EU member states (Bulgaria, Poland, Romania, Slovakia, the Czech Republic, Hungary) have already completed the reforms of the so-called "first generation" and have reached the final stage of reforming the economic security system.

Just as the state review of economic security is diverse, the list of threats and risks is very variable (Table 1).

Table 6. The threats to economic security

State	Threat
China	Tight state regulation of the economy, relatively low level of natural resources, dependence on foreign financial capital, significant pressure, and competition from TNCs.
India	Growing and meanwhile low level of economic development, low level of competitiveness of goods, dependence on foreign capital, problems of corruption; income inequality; labor market imbalance; the collapse of system-forming financial institutions and monetary systems; low level of energy efficiency; lack of water resources; underdeveloped infrastructure
USA	The US trade war with China; further reduction of the Fed rate; budget deficit and higher debt-to-GDP ratio; inflation index; unemployment rate; further slowdown in exports compared to imports; risk of recession; extraordinary growth in trade policy uncertainty; ever-increasing debt,

	trade, and capital imbalances, declining international competition and industrial efficiency compared to other countries, growing dependence on foreign supplies of strategic materials and technologies, corruption and lobbying, state separatism
UK	Technical recession; overvalued housing market; low growth of labor productivity; stagnation of the real level of wages
France	Actions and protests; unemployment; terrorism; high public debt; corruption
Ukraine	High level of dollarization of the economy; inconsistency of the level of labor productivity with neighboring countries; reducing the efficiency of public administration; criminal offenses (corruption, money laundering); the problem of war, including global; lack of rule of law; the national economy dependency on foreign markets; low rates of the domestic market growth; debt dependence of the country, critical volumes of payments; "shadowing" of the national economy

Source: authors' conclusions based on official strategic documents of the mentioned states

Table 1 pushes to the conclusion that every country in the modern world, regardless of its level of economic development and capacity in the international arena, has significant threats to national economic security. The ability of countries to respond to modern threats becomes the basis for guaranteeing their economic security. Changes in geopolitical conditions pose risks to both the state economy (Botoroga et al, 2021) and its economic security. In particular, among others, the following economic risks could be highlighted (Fig.1):

Figure 1. Economic risks to the economic security under current geopolitical trends

Source: authors'

3. Statistical analysis: globalization and other risks to economic security

Currently, the main political trend in recent years can be considered as the erosion of support for global development and the growth of protective sentiment. This is due to the rejection of the current economic model of the "golden billion" countries by a large number of societies.

Globalization increases the vulnerability of countries to fluctuations in international markets. That is, globalization increases consumption and production, combined with unequal access to resources. To illustrate, the dynamics of the globalization index can be considered (Fig. 2). It consists of three parts: the index of economic globalization, the index of political globalization, and the index of social globalization.

Figure 2. Dynamics of world indices of globalization for 2001 – 2018, where green – index of economic globalization (%); yellow – index of social globalization (%); red – index of political globalization (%), blue line – world index of globalization

Source: authors' compilation on the data of KOF Globalization index

Economic globalization includes trade and financial globalization. Trade globalization in its turn consists of such variables: the exchange of goods and services over long distances, the number of exports and imports of services as a share of GDP, and the diversification of trading partners. Financial globalization is represented by capital flows and stocks of foreign assets and liabilities. Social globalization concludes interpersonal, information, and cultural globalization. Political globalization is measured by the participation in UN peacekeeping missions and the number of embassies in the country. The remarkable aspect is that the financial crisis of 2008 did not affect political and social globalization.

The analysis shows that the value of the globalization index increased from 2001 to 2018 by 16.43%. If at the beginning this index and its components fluctuated around 40, now these values exceed 60. However, if the level of political and social globalization is constantly growing, the level of economy in recent years has even decreased. After the financial crisis of 2008, there was a gradual slight decrease due to protectionist measures in the countries, the race of devaluations observed after the crisis, the decline in confidence in the US dollar as a means of payment.

The experience of financial crises has shown that a careful analysis of the situation on world commodity and financial markets, adequate diagnosis of vulnerabilities of the external sector of the economy and national public finances, as well as a correct assessment of public debt growth are important elements of public debt management. Therefore, it is necessary to compare its parameters with macroeconomic indicators, in particular with the growth rate of GDP, the state budget deficit, as well as with the main trends in the global financial market (Table 2).

Table 2. Debt of the general government sector in 2013 - 2019 (% of GDP)

Year	2013	2014	2015	2016	2017	2018	2019
World	78,5	78,8	80	83,1	82,4	82,1	81,9
Developed states	105,4	104,8	104,4	106,9	105,4	103,9	103,1
USA	105,4	105,1	105,3	107,2	107,8	108,0	109,4
EU	91,3	91,8	89,9	88,9	86,6	84,2	81,7
France	93,5	95,0	95,8	96,6	97,0	96,3	96,2
Germany	77,4	74,7	71,0	68,2	64,1	59,8	55,7
Italy	129,0	131,8	131,5	132,0	131,5	129,7	127,5
Spain	95,5	100,4	99,4	99,0	98,4	96,7	95,1
Japan	232,5	236,1	231,3	235,6	236,4	236,0	234,2
UK	85,6	87,4	88,2	88,2	87,0	86,3	85,9
Canada	85,8	85,0	90,5	91,1	89,7	86,6	83,8
Developing states	38,6	40,7	44,0	47,0	49,0	51,2	52,9
Asia	41,5	43,6	44,8	47,2	50,1	52,3	54,5
China	37,0	39,9	41,1	44,3	47,8	51,2	54,4
India	68,5	67,8	69,6	68,9	70,2	68,9	67,3
Russia	12,7	15,6	15,9	15,7	17,4	18,7	19,5
Poland	55,7	50,2	51,1	54,1	51,4	50,8	49,8
Ukraine	40,5	70,3	79,3	81,2	75,6	78,4	76,9
Latin America	49,3	51,4	55,5	59,0	61,8	66,4	67,4
Brazil	60,2	62,3	72,6	78,4	84,0	87,3	90,2
Mexica	45,9	48,9	52,9	56,8	54,2	53,5	53,4
MENAP	23,5	23,6	33,7	41,1	40,3	42,5	43,3
Saudi Arabia	2,1	1,6	5,8	13,1	17,3	20,0	23,8
South Africa	44,1	47,0	49,3	51,6	52,7	54,9	55,7
Low-income countries	31,5	31,8	38,0	40,8	44,3	45,5	44,9
Nigeria	12,9	13,1	16,0	19,6	23,4	26,8	27,4
Countries Oil producers	32,9	33,8	39,7	43,3	43,2	45,2	45,2

Source: IMF data

The representative picture could be found in the trace of the debt indicator (Fig. 3). Starting in 2015, the change in the level of debt is decreasing "parabolically", and in 2024 would reach the level of 2009, however, the COVID-19 changed this trend.

Figure 3. Changes in the level of debt in the Eurozone, where blue - data for the end of 2019, red – delta changes in 2008-2019

Source: IMF data

4. Methodology

Taking into account principal world concepts on economic security and the literature review results the main components of ES are suggested based on the most impactful risks and challenges: macroeconomic, financial, foreign economy, investing, social, R&D, energy, demographic, and food components. Thus, the assessed index of ES should reflect a list of factors that guarantee the independence of the national economy, its sustainability, the ability to continuously update and self-improve after the imposing of the risks and challenges to the above-indicated components. The index of ES should consider that the object of ES is considered in the national system of the country, its certain areas of activity: military, social, political, legal, information, etc.; in the society - with its institutions, organizations, firms, enterprises, and individuals. Meanwhile, the subjects of the ES are recognized in state and local executive and legislative bodies, ministries, departments, commercial and non-commercial organizations, etc.

The comprehension of indicated position in the approach to the ES pushes to the draw of the conceptual scheme of modeling the economic security of the country (Fig. 4).

Figure 4. The conceptual scheme of modeling economic security.

Source: authors'

The presented concept initiated the next method to assess the index of economic security of the state. The economic security index for country i can be calculated by the formula of the geometric mean:

$$I_{es} = \sqrt[4]{I_1 \cdot I_2 \cdot I_3 \cdot I_4}$$

where I_i – indices of social, macroeconomic-financial, industrial-service, and resource security, respectively.

The index of each type of security is calculated by the formula:

$$I_{its} = f \left(\prod_{i=1}^{u_i} \frac{g_{ijts}}{g_{ijtw}} \right), i = \overline{1,4}$$

where g_{ijts} – the ES index for a j -th group of i -th index in t for the states; g_{ijtw} – the value of the safety index for the j -th group of the i -th index at time t in the average for all countries participating in the study; u_i – the number of parameters when calculating the i -th indicator; $f()$ – conversion function that allows you to normalize the value. As a rule, the root is used to such an extent that it corresponds to the number of elements taken into account in the formula.

The value of the index within the group is based on similar formulas, but special indicators are used to reduce the impact of the lack of data in the database:

$$g_{ijts} = \prod_{k=1}^{p_{ij}} W(H_{ijkts})$$

where

$$W(H_{ijkts}) = \begin{cases} \frac{K_{ijkts}}{K_{ijkw}}, & \text{if } K_{ijkts} \text{ exists and } K_{ijkw} \text{ is calculated for more than 30 countries,} \\ 1, & \text{otherwise,} \end{cases}$$

where K_{ijkts} – indicator from the database for country s , used to calculate the security index for the j -th group of the i -th index at the time t ; K_{ijkw} – the average value for the above indicators for all countries for which information is available at time t .

Cluster analysis is performed to group by the similarity of certain units of the population, given by a set of features. Usually, such units are expressed geometrically, as points in multidimensional space, the proximity of the location of which indicates membership in a group. In this case, such closeness can be assessed by indices (used for traditional classification) or to some extent by similarity, which automatically distinguishes clusters. Such a degree of similarity can usually be a similarity coefficient or distance (population units are given in the form of vectors, where the signs are their coordinates).

In this study, the units of the population will be countries (vectors) with two features (coordinates), analyzed in the previous sections:

1. Percentage gap between traditional and "green" GDP;
2. ES index.

Clustering can be performed using hierarchical or iterative methods, but primarily the result depends on the choice of metrics for the degree of similarity. In this study, such a metric was the Euclidean distance for both hierarchical and iterative approaches.

5. Results

Using the above formulas, the calculation of the economic security index for European countries and other states for the comparison is performed based on annual data from the World Bank database since 1991. A total of 240,473 observations are used. The database indicates the appropriate stimulants and destimulators following the method

and the normalization of data according to the rules described above. The most representative is to consider the following graphs (Fig. 5-7). Let's consider some assessed results in detail. Lithuania (Fig. 7) had a decline in 2014 due to the beginning of the war in Ukraine, the restructuring of trade flows, changes in trade with Russia. There was a temporary deterioration. Then the substitutes came, and the situation emanated to a stable level. As to the USA (Fig. 8): they lost global influence, i.e. they were ahead of the world, but the level of lead was declining. However, after the discovery of shale technology, the situation has been stabilized.

Figure 5. Dynamics of the index of economic security of Belarus for 1991-2018

Source: authors'

Figure 6. Dynamics of the index of economic security of Ukraine for 1991-2018

Source: authors'

Figure 7. Dynamics of the index of economic security of Lithuania for 1991-2018

Source: authors'

Figure 8. Dynamics of the index of economic security of the USA for 1991-2018

Source: authors'

The presence of a trend on graphs (Fig. 5-7) is not considered as a model for forecasting, and therefore its qualitative characteristics may be insufficient to ensure the adequacy of dependencies. However, the equation itself graphically allows showing in which direction the index of economic security changes. The calculated time trend, in

particular for Ukraine means that each year the economic security index decreases by an average of 0.0054 (Fig. 6), as the obtained equation has the form:

$$y_t = -0,0054x + 0,8329$$

Next, there is the consideration of the situation with economic security in Germany, which is a stronghold of the European Union (Fig. 9). The general index of economic security until 2016 was more than 1, which indicates the progressive nature of the economic development of the country. The maximum value was reached in 2007 – 1.14. However, then the country failed to be the flagship, which led to a drop in economic security in 2014 to 1.04. Of course, this figure is higher than the European average, but not as much as a decade ago.

Figure 9. Dynamics of the index of economic security of Germany for 1991-2016

Source: authors'

To understand the dynamics of the index one should consider the components of security for this country (Fig. 10). First of all, a significant decline was observed in resource security. Because of the opening of new gas pipelines from the Russian Federation, Germany's dependence on energy supplies has increased significantly. In particular, if the dependence on gas supplies in 2007 was 43.4%, in 2016 – 60.3%. Moreover, this value can increase significantly if the next Nord Stream-2 gas pipeline is launched. During the same period, dependence on oil supplies increased from 28.1 to 33.2%, solid fuel from the Russian Federation - from 22.3 to 28.0%. In addition, it should be noted the rapid development of renewables in Europe, for which Germany has failed to adhere to leadership positions. Also, a certain factor in reducing resource security was the policy of closing nuclear power plants in the country. Germany's financial and macroeconomic security has also declined over the past couple of years, caused by the economic slowdown, the complexity of export operations due to the euro's overvaluation, and the eurozone's overall debt problems.

Figure 10. Dynamics of the structural components of economic security index of Germany for 1991-2016, where orange – resource security, grey – financial – macroeconomic component, yellow – production and service security, blue line – social security.

Source: authors'

The decline of industrial and service in Germany is due to the growth of production capacity in other countries, especially in China. As a result, Germany's production potential plays a smaller role in the world than in previous years.

Germany's decline in social security is linked to the leveling of social standards and increased life expectancy in Europe as a whole. It is quite difficult to significantly increase social standards in the conditions of active population migration, the influx of low-skilled labor from Asian countries (especially Syria), and the previously achieved high level of medical care. As a result, social security is expected to fall further for at least a few more years.

Another key country of the European Union is France (Fig. 11). The dynamics of the economic security indicator for France are very similar to the German one, in particular, there is an increase in the economic security index until 2006, after which there is a gradual decline until 2013 inclusively. As in the case of Germany, there is a sharp decline in the index, although it reaches only a value of 0.95, after which it begins to rise.

A study of the economic security components in France (Fig. 12) explains such changes. For a long time, resource security has been the basis of a high level of economic security. A resource-rich country with a significant number of nuclear power plants had every reason to be considered prosperous. However, due to the overproduction of electricity, the moment was missed when countries began to generate energy from renewable sources, which caused a serious reduction in resource security after 2015. The influx of migrants with low incomes has led to social security problems. This affected both the availability of medicine and the assimilation of new citizens, as well as the

unemployment rate. All these problems created grounds for a reduction in financial and macroeconomic security. Since 2016, this value has become less than 1, i.e. below the European average. Also, a certain threat to France is the possibility of a debt crisis in Italy and Greece, where French banks have invested a significant part of the funds.

Figure 11. Dynamics of the index of economic security of France for 1991-2016

Source: authors'

Figure 12. Dynamics of the structural components of economic security index of France for 1991-2016, where orange – resource security, grey – financial – macroeconomic component, yellow – production and service security, blue line – social security.

Source: authors'

Similar to Germany, France lags in industrial and service safety, owing to a significant increase in Asian production.

To illustrate France's problems, it is necessary to examine the Italian economic security index, which has serious problems with the formation of a state budget that would comply with the agreements within the European Union due to the high level of debt. This country showed the dynamics of the general index at the level of average European values until 2013, after which there was a decline to 0.99 (Fig. 13). However, in general, the dynamics of the Italian economic security index are in line with Central European trends.

Figure 13. Dynamics of the index of economic security of Italy for 1991-2016

Source: authors'

The dynamics of the structure of the index of economic security of Italy are shown in Fig. 14. A significant decline was recorded in the resource security indicator, which can be explained by the same reasons as for Germany and France. However, it should be noted that the indicator remains higher than 1. The decline in financial and macroeconomic security in Italy has been recorded since 2007, and in almost all years of observations, the index of this type of security has never reached the European average.

Figure 14. Dynamics of the structural components of economic security index of Italy for 1991-2016, where orange – resource security, grey – financial – macroeconomic component, yellow – production and service security, blue line – social security.

Source: authors'

For further analysis, the division of the countries directly by geographical and economic affiliation is considered. This is to analyze the state of economic security in the regions of Europe (Fig. 15).

Figure 15. Dynamics of the index of economic security of Europe for 1991-2016, blue line – West Europe, orange – North Europe, grey – South Europe, yellow – East Europe, green – Black-see Europe.

Source: authors'

The second step of the research is to count Euclidean distances between observations for each country based on the assessed index, then 5 clusters are formed by minimizing distances. These clusters combine countries with relatively the same level of ES index. Thus, the assessment of the ES index for the states made it possible to locate the states in the cluster on the maximum level of their similarity (Table 3).

Table 3. Clusterization according to ES index

Cluster	Definition of the cluster	States
1	The highest index of economic security (1,0013-1,0364)	Andorra, United Kingdom, Denmark, Ireland, Luxembourg, Malta, Netherlands, Norway, San Marino, Sweden
2	The economic security index is above average (0,9662-1,0013)	Austria, Belgium, Estonia, Iceland, Liechtenstein, Germany, RF, Slovenia, Finland, France, Switzerland
3	The index of economic security at the average level (0,9311-0,9662)	Greece, Spain, Kazakhstan, Cyprus, Belarus, Latvia, Lithuania, Portugal, Romania, Serbia, Slovakia, Hungary, Croatia, Czech Republic, Montenegro
4	The economic security index is below average (0,896-0,9311)	Azerbaijan, Bulgaria, Georgia, Italy, Macedonia, Poland, Turkey
5	The economic security index is the lowest (0,869-0,896)	Albania, Bosnia and Herzegovina, Armenia, Moldova, Ukraine

Source: authors'

6. Conclusions

In this paper, the concept of calculation of the index of economic security of the country is presented. Unlike various signaling approaches, the economic security index is calculated solely based on a comparison of the state of the economy with other countries. The structural components of the economic security index are the indices of social, macroeconomic-financial, industrial-service, and resource security. Using the analysis of data from European countries, the indices of economic security and its components for the period 1992-2018 were calculated, their dynamics for the main blocs of states were analyzed.

In general, it can be shown that the method of calculating economic security indices and their components can differ significantly depending on the developer of the methodology, the customer, the available data. However, the correct index of economic security should reflect, first, the simplest model of the economy in which the individual or household, firms, and markets of resources and goods operate. This index should not vary significantly if new objects are created in the economy. With this in mind, the author's index of economic security was developed, which includes four main components: index of resource security, index of industrial and service security, index of financial and

macroeconomic security, index of social security. As calculations have shown, Ukraine lags far behind the average European level of economic security, and in all its components. As of 2016, the lag behind the European average was at least 14% or about 12 years.

The analysis shows that in 2016 there was a significant decline in resource security in the above countries. However, the construction of the index is such that there must be countries that will increase their level of security. For resource security in 2016, we can identify such countries as Switzerland (1.12), Belgium (1.11), and France (1.08).

The review of industrial and service safety also indicated a significant decline for European countries in 2016. However, some raised the corresponding index. These include San Marino (1.06), Switzerland (1.06), Belarus (1.06), Monaco (1.06), Malta (1.05), Ireland), Liechtenstein (1.03), Luxembourg (1.03), Iceland (1.03), Netherlands (1.02), Sweden (1.01), Estonia (1.01), Andorra (1.01). As we can see, the list includes rather small countries, where it is easy to achieve high rates of informatization, the introduction of new communication technologies, e-government, etc.

Estonia (1.05), Great Britain (1.03), Denmark (1.02) are the leaders with data for 2016 according to the index of financial and macroeconomic security. These countries have relatively low debt obligations and stable economies.

Finally, the leaders in the level of social security for 2016 are Monaco (1.08), Belgium (1.07), San Marino (1.07), Luxembourg (1.04), Finland (1.02), Andorra (1.02), Spain (1.01), France (1.00).

The obtained values of the indicators of the economic security index allow cluster analysis of countries, in particular, to classify countries according to their response to budgetary, financial, energy, or other shocks. Cluster analysis reveals significant groups of data. Depending on the chosen methodology of cluster analysis, different results may be obtained.

The cluster analysis allows determining the economic security of the Nordic security countries that exceed other groups. This result is confirmed by the fact that the happiest people live in these countries. The state of Western Europe is slightly inferior to these countries. The third place is occupied by the countries of Southern Europe. Eastern European countries have a lower level of economic security than the European average. Finally, the worst indicators are in the Black Sea basin. Thus, it turns out that the level of neighboring countries is decisive in the analysis of economic security.

The presented methodology is quite easy to adapt for the calculation of regional security within one country or interstate entity. This makes it possible to further extrapolate this methodology to determine regional security. If it is necessary to determine the regional index of economic security, it is possible to use not the whole range of indicators, but only those defined for a particular area. At the same time, the basic principle of calculation does not change. For the most representativeness of the methodology, the appropriate list of states is selected to consider as world leaders, as fragile states, the unions, and the states that had gone out of it.

7. References

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