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Assessment of the EU and Ukraine Economic Security and Its Influence on Their Sustainable Economic Development

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Abstract: The article proves that security of the national economy characterizes the ability of the country to withstand the destabilizing effects of various internal and external threats and to ensure its sustainable development. The study is carried out in the following stages: Diagnosing threats to security of the national economy → assessing the level of economic security of countries of the world → clustering countries of the world according to the level of economic security → modelling the impact of the national economic security on sustainable economic development of a country → forming measures to ensure security of a country's economy. The basis for assessing the level of economic security of a country is a hierarchically constructed system of indicators, including composite, complex, and sub-indicators. The assessment of the level of economic security is carried out on the basis of international indices and rankings. The analysis of the correlation between the level of GDP per capita and individual indicators included in the composite indicator of economic security made it possible to identify those that should become the primary concerns of governments in order to enhance economic security as well as increase the level of GDP and ensure sustainable development of countries.

Keywords: economic security of a country; sustainable economic development; security threats; composite assessment; international indices and rankings; cluster analysis; correlation analysis; regression modelling

1. Introduction

The problem of ensuring economic security, which characterizes abilities of one or another country to withstand destabilizing actions of various internal and external threats and maintain its sustainable development and competitiveness in the world economic system, becomes more and more urgent under conditions of activation of globalization processes.

Quite a few modern studies (Relationships between 2020 [1], Jankovska et al., 2018 [2], Andruseac 2015 [3], Khaustova and Grigorova-Berenda 2013 [4]) underline the growing urgency of ensuring economic security and its taking on new significance, which is associated, first of all, with global socio-economic political processes (Jankovska et al. 2018 [2]). As it is specified in (Relationships between 2020 [1]), economy is closely connected both with national and international security in the interrelated and interdependent world. Economic security is an important component

of national security. The economy influences national security, forming principles and specific features of the society functioning inside the country, and determines the country's geopolitical state on international scale.

Due to this, economic security has already become an important strategic priority for the governments of a range of world countries (Relationships between 2020 [1], Gryshova et al., 2019 [5]). "Economic security is not a new concern of governments. Economic instruments have long been part of the toolkit of statecraft, a means to influence other states and their policies" (Kahler 2005 [6]).

So, the timely identification, avoidance, and neutralization of real and potential threats to the national economic interests are a guarantee of realization of the country's macroeconomic goals and assurance of its economic security and sustainable development. In this regard, of relevance are the issues of assessing the level of economic security of countries of the world and its impact on their sustainable development to further identify threats to national economic interests and comparing the level of economic security of countries to analyze the policy for ensuring economic security that they are pursuing, its efficiency and effectiveness.

At present, a lot of research deals with analyzing various aspects of the problem of economic security, assessing its impact on the development of countries of the world and their competitiveness. Among them, the issue of objective assessment of economic security and identification of the main threats, at the elimination of which the efforts of governments should be directed to ensure sustainable development of countries, remains a key one. Scientists and practitioners use quite a few different approaches to assess economic security, but currently there is no single or most accepted assessment methodology. The application of methodologies, as a rule, is determined by the goals and objectives of individual studies of economic security. In our opinion, approaches to assessing economic security of countries in order to define further government measures aimed at mitigating and eliminating the main threats require further research. At the same time, for the purposes of analyzing the existing state of security in a country and making appropriate decisions to maintain it, it is advisable to develop and use a methodology that will allow analyzing security both in terms of aggregate indicators—economic, social, etc.—and in terms of individual ones—macroeconomic stability, education, employment, etc. It is this that will facilitate making sound decisions on the development of measures to ensure a country's economic security and its state policy in this area, in particular.

Our research is aimed at assessing the economic security of EU countries and Ukraine and its impact on their sustainable development. This is due to the fact that at present the EU-Ukraine Association Agreement has been signed and ratified by the Verkhovna Rada of Ukraine and the European Parliament, and the partial application of some parts of the Association Agreement has come into force. Thus, European integration is a key priority of Ukraine's foreign policy.

However, this process involves both advantages and risks for Ukraine. Political advantages of the integration are seen in the creation of reliable mechanisms for political stability, democracy, and security. Social ones are associated with the desire to gradually achieve a high level of social standards, health care, effective protection of human rights, decent living conditions, environmental protection, etc. Economic advantages are related to increasing the pace of modernization, ensuring free movement of factors of production within the EU, creating a more favorable investment environment, etc. Risks of the integration process are related to the need for measures to bring various spheres and activities in line with EU standards not only at the macroeconomic level but also at the level of individual enterprises, strengthen the foundations of a market economy in Ukraine, and preserve strategically important industries, prevent labor outflow, etc. In this regard, the role of protecting the national economic system as the main factor in ensuring the economic security and sustainable development of the country is increasing.

The ability to ensure a sufficient level of security and stable development of the Ukrainian economy in the context of integration processes is provided by a wide range of factors. However, the top priority, in our opinion, is to study the existing situation in terms of economic security in the EU and Ukraine, which implies: Identifying the main threats to the national economies of EU countries and

Ukraine; assessing, comparing, and analyzing the level of economic security of EU countries and Ukraine, as well as studying its impact on the level of development of the countries; identifying the main differences between the countries in terms of the basic indicators characterizing threats to their economic security in order to consider the positive experience of EU countries in this area and further develop a set of measures to mitigate the most significant threats and ensure stable development of Ukraine. Based on this, the structure of our study will be built in accordance with the following three main stages: Formulating theoretical principles of assessment and analysis of the level of economic security of world countries; assessing the level of economic security of EU countries and Ukraine; comparing and analyzing EU countries and Ukraine, as well as studying the impact of the level of economic security on stable development of the countries.

The results of the study can serve as a guideline for the development of measures to ensure the economic security of the considered countries as well as the basis for further developments to form the state policy of Ukraine, taking into account the practices of EU countries in this area.

2. Literature Review

As noted earlier, at present, a lot of research by scientists and practitioners deals with analyzing various aspects of the problem of economic security. Moreover, the tools they use are quite diverse.

The study of Ignatov 2019 [7] highlights qualitative and quantitative analysis of economic indicators of the EU member-states for identification of main problems, which the member-states face at the moment, and determination of the degree to which these problems could undermine the future European economic security. Assessment is directed at identification of main socio-economic threats and their arrangement in accordance with the level of demolition potential. The study is carried out based on analysis of the quantitative indicators of the world countries.

Simanavičienė and Stankevičius 2015 [8] present an analysis of the economic security problems in the Lithuanian economy and determination of its internal and external threats. Economic security is considered by the authors as a guarantee of a country's competitiveness. The authors studied the level of a country's economic security using indicative analysis, namely: Monitoring key macroeconomic indicators and comparing them with some of the pre-defined critical values and assessment pace of the country's economic development according to main indicators of macroeconomic changes.

The work of Karanina and Kartavyh 2018 [9] deals with the state and problems of the Russian economic security. The authors consider economic security as "the likelihood of negative risk events and threats and the country's ability to resist them in order to ensure stable sustainable development of the national economy". It is offered to conduct assessment of economic security through examining quantitative indicators (the rate of inflation, GDP growth rate, and others). Determination of threats and prospects of economic security is carried out on the basis of SWOT analysis.

The study of Osberg and Sharpe 2011 [10] highlights the issues of economic insecurity of rich and poor nations. This paper examines trends in the IEWB Economic Security Index for four affluent OECD countries and compares a cross-section of 70 rich and poor countries. The scholars also reviewed the IEWB index of security and offered some corrections.

Andruseac 2015 [3] considers the factors that determine and influence countries' economic security in the modern world and underlines the huge impact of globalization on the state countries' economic security.

Relationships between 2020 [1] is an analytical report, developed using the results of RAND Europe work, which was ordered by Research and Documentation Centre (WODC) (Netherlands) with the aim to study the interconnection between the economy and national security for determination of characteristics and assessment of the Netherlands economic efficiency, its national security, and formation of the further development prospects. Determination of the critical economic sectors, critical infrastructure, and critical processes was laid in the foundation of the study. The 'risk vector' concept, which is based on analysis of macroeconomic variables and economic events, was proposed for conceptualization of interconnections between economic factors and functioning of society.

So, according to the analysis of modern studies, a country's economic security is considered nowadays as an important component of its national security, which determines prospects for sustainable development of the country and its place in the international division of labor.

At the same time, independent of the rather active scientific interest in the specified range of problems, the analysis of the scholars' works testifies to the fact that there is no common generally accepted concept of the national economic security in the world science. Researchers from different countries use methodological approaches and develop measures on the basis of understanding the essence and components of economic security and historic, geographic, and political specific features of the country. The approaches that dominate in countries become the basis for development of the state policy documents.

The 'economic security' concept is considered in the EU from the point of view of unification and the place in the world economic system. The EU gives the priority role to European integration with the aim of achieving a high level of competitiveness under globalization, believing that an individual EU member-state has a smaller amount of economic resources than other developed countries, so the synergy effect is achieved through interchange of resources, which determines the EU capability of ensuring a high level of economic security and competitiveness (Ocepek 2010 [11]).

The phrase 'economic security' is used in official US documents with respect to the country as a whole; moreover, it is practically not used with respect to private persons and households. However, different economic issues are regularly considered from the point of view of security. In general, in accordance with the American approach, the term 'economic security' expresses the idea of interconnections of the stable economic growth, the country's economic independence, and strong position in the world trade market in connection with the military security (Perevalova 2007 [12], Murdoch et. al., 2001 [13]).

Depending on the chosen security concept, every country forms its own system of ensuring economic security. Moreover, highly developed countries, in particular, Germany, Great Britain, and United States, not only form the local system of national security but also exert influence on the security systems of the countries they are interrelated with.

The main strategic goal of the Western European countries and United States in the field of protection of national economic interests is ensuring the stable economic growth and economic modernization with regard to the conditions of competitive struggle in the world market.

The concept of a country's economic security in the developed countries is quite often an equivalent of the economic policy concept and the function of the chosen direction of economic development. For example, in Germany, they understand economic security as stability of economic development. The policy in the sphere of ensuring security in Great Britain is closely connected with the defense policy: They are both based on the national interests and realized through their protection. In the UK economy, 'national interests' are considered as economic interests of the whole society in general, which have priority with respect to other forms of social interests [14]. The system of ensuring economic security of Great Britain has its specific features. Threats to the national economic security are divided into external and internal ones and are arranged by the degree of significance and probability of emergence. With regards to the sphere of prevention of economic threats, the government traditionally rests on the private business, maximally supporting it. The country has a branching network of institutions (the Confederation of British Industry, East European Trade Council, and other specialized organizations), which ensure efficient interaction of the Parliament, Government, and big enterprises in the process of development and realization of decisions that have to do with ensuring the national economic security. In France, economic security is understood as the prevention of economic threats through providing new schemes, adaptation of norms and structures of international security, and development of the cooperation network between the public and private sector and between the states (Khaustova and Grigorova-Berenda 2011 [15]). The main strategic goal of the Netherlands, Denmark, Belgium, Luxemburg, and Switzerland with respect to protection of national economic interests is ensuring a

stable economic growth and modernization of the economy with regard to the conditions of competitive struggle in the world market (Ocepek 2010 [11]).

The policy of ensuring economic security of Poland, Slovakia, Hungary, and Baltic countries is based on convergence of national interests with the common European interests and also political, economic, and institutional transformation in accordance with the West European standards. A certain economic underdevelopment compared to West European countries, structural deformation of industry, and dependence on import of resources could be named as the main threats to economic security of the countries of this group.

The post-Soviet countries have their own specific features of formation of the economic security system. There is difference in ensuring national economic security in EU countries and post-Soviet countries. Thus, European countries try to align themselves with the standards and experience of the leading EU countries, first of all, Germany, while post-Soviet countries are under the influence of Russia (Moldova, Ukraine, and Belarus).

The Russian Federation legislation specifies vital interests in the economic sphere, criteria and parameters of the economic state, and measures and mechanisms of economic policy directed at ensuring economic security focusing on ensuring economic security of regions. In contrast with Russia, the list of national economic interests of Ukraine is not worked out in detail, which hinders the formation of an efficient system of ensuring economic security of the country.

A discussion is going on among scholars with respect to theoretical discrepancies in determining the essence, structure, and functions of economic security.

As it is specified in Relationships between 2020 [1], apprehension of the national security has been developed under the influence of changes in international relations, historic events, and tendencies.

Researchers of RAND Europe specify that stability, security, protection, and freedom from fear, threat, and conflict are considered today as main subjects, which are studied by politics and scientific literature when determining national security. Security could also be determined from the point of view of human values, for example, physical safety, economic welfare, independence, and psychological wellbeing (Relationships between 2020 [1]).

Simanavičienė and Stankevičius 2015 [8] underline that analysis of the economic security concept is conducted today mainly in terms of economic development and stability. This approach allows determining economic security of the state, economy, and population through ensuring protection of national interests, development of country in general, and sufficient defense potential.

Karanina and Kartavyh 2018 [9] also underline that it is sustainability that is “the highest degree of economic security of the country”.

Andruseac 2015 [3] specifies that economic security is determined by availability of required means and possibilities for ensuring wellbeing in the economic system, which is accessible for people and constantly grows. The author also underlines that economic security has become the factor of stability or instability with respect to political and military conflicts under conditions of the modern globalized world. The author believes that “the process of globalization contributed to a change in the concept of economic security, not only that we have a wider and more complex approach with an increased number of involved actors but also a reconsideration of the threats” (Andruseac 2015 [3]).

The study (Relationships between 2020 [1]) considers factors and processes that determine economic and national security of the Netherlands through the prism of influence on the sustainable functioning of society and threats, which may emerge. The study notes that national security and economic security in particular become closely connected with prevention of destructive impact on society (e.g., through economic indicators or critical processes).

Thus, the issues of a country’s economic security are considered quite thoroughly in modern studies. Various interpretations of the concept “economic security of a country” are used. Today, economic security of a country is most often regarded as its ability to ensure sustainable development of society. Furthermore, the concept of economic security, goals, and views on its provision differ in different countries. Various methods and approaches to safety assessment are proposed. They can be

based on indicative analysis, analysis of various kinds of quantitative and qualitative indicators, use of integral indicators and indices, etc., depending on the goals and objectives of the analysis. Moreover, in developed countries, problems of economic security are often considered within the framework of national security. The key goal in this case is the preservation of the sovereignty of countries and their stable economic growth.

The approaches to assessing and analyzing economic security differ from country to country, making it difficult to carry out comparisons of countries. The international composite index of economic security of countries has not yet been developed. However, for these purposes, researchers widely use separate indices developed by international organizations, which characterize individual components of national economic security, namely: Doing Business, Global Competitiveness Index, Legatum Prosperity Index, Human Development Index, etc.

Also, to determine the level of economic security of countries of the world, the concepts of country sustainability, reliability, country risk, and stability are employed; and, to assess economic security, two approaches are most widely used: (1) Calculation of composite indicators of sustainable development of countries; (2) assessment of country risks. One example of country risk assessment is the BERI methodology by the Business Risk Information Institute [16].

One of the fairly well-known methods used for composite assessment of national economic security in international studies is the Composite Index of National Capability (CINC) (Singer 1980) [17]. CINC is built on a set of demographic, economic, and military indicators. Methodologically, CINC is calculated as the arithmetic mean of six indicators: Total population of country ratio; urban population of country ratio; primary energy consumption ratio; military expenditure ratio; and military personnel ratio. Each of the ratios is a percentage of the global value. Thus, the ranking based on the overall CINC score allows for cross-country comparison. However, the need to take into account a large amount of statistical data in the calculations makes it difficult to carry out rapid analysis using CINC. Even if there is no task of constructing a general ranking of countries, world statistics are still required for each indicator. In our opinion, CINC largely reflects the weight of the national economy in the world economy and does not reflect the threat to the economies of the studied countries.

The National Power Index (NPI) is used as another method of composite assessment of national economic security [18]. It is built on the basis of a set of economic, military, political, and technological indicators. Methodologically, NPI is a composite of five sub-indices, each of which has a certain weight in the index, namely: Economy Index—economic security and power (35%); Military Index—military security and power (35%); Diplomacy Index—diplomatic influence (10%); Technology Index—technological power (10%); Popularity Index—popularity and influence across the world (10%). The NPI methodology requires not only global data, but also data on the rest of countries to calculate the index for a particular country. In this regard, it should be noted that although NPI includes the indicator of economic security, its applied use is difficult due to the cumbersome calculation methodology, the need to analyze a huge amount of statistics, as well as the dependence on the regularity of publication of such statistics by country.

Also, the methodology for calculating the National Power Rankings of Countries is proposed in the study Białoskórski, R. et. al., 2019 [19]. The methodology enables calculation of three types of state power: Economic (general) power, military power, and geopolitical power as a resultant of the two former ones. The economic (general) power consists of economic outcomes (gross domestic product), demographic factors (population), and spatial factors (territory area). This approach takes into account a small number of economic factors. This limits its use in analyzing the economic security of countries.

To analyze the economic security and stability of the world's economies in the context of the COVID-19 pandemic, the American insurance company FM Global developed the Resilience Index [20]. The FM Global Resilience Index is an equally weighted composite of three core factors of resilience: Economic, risk quality, and supply chain. Each factor is comprised of four drivers. Thus, the index ranking is based on 12 equally weighted indicators (drivers) of resilience in three categories. The ranking includes 130 countries of the world. By comparing the rank of a particular country with its initial

response to the pandemic, FM Global singled out the states that are highly likely to be able to maintain stability and sustainability of the economy throughout the crisis. The 10 most resilient economies include the Netherlands, Switzerland, Denmark, Germany, Finland, Sweden, Luxembourg, Austria, United States (Zone 3), and Great Britain. Ukraine occupies the 84th place in the ranking.

The analysis of the considered composite indicators and indices employed to assess economic security makes it possible to single out a number of limitations in their use. First, the calculation of many of them involves a laborious processing of extensive statistical data on countries, with the accumulation of inaccuracies as a result of using different methods to calculate some indicators in different countries. Secondly, due to the need to obtain statistics by country, significant delays caused by their unavailability are likely to occur, which leads to the impossibility of timely assessment. Thirdly, the most widely used methods of composite assessment are often based on a very limited number of indicators, which does not allow taking into account all the threats to a country's economic security.

With regard to this, in our opinion, comprehensive research on assessing economic security in countries around the world with the aim of comparing them in terms of security levels and analyzing the effectiveness of security policies in terms of impact on their sustainable development is not enough. Moreover, the economic security of EU countries and Ukraine has not been considered in this context. The methods for assessing economic security used in the international practice have a number of application limitations. Thus, our research is aimed at further developing a methodology for assessing and analyzing economic security of countries.

In our view, one of the key issues in assessing economic security is the choice of the basis for the assessment, namely, a set of indicators that take into account all the main threats to a country's economic security. The analysis of scholars' work and current legislation of some countries showed the absence of uniformity of thoughts with respect to selection of indicators for assessment of the economic security level. As it is mentioned above, scientists propose various methods of and approaches to security assessment. At the same time, many existing methodological approaches are complicated for practical application, which does not allow (on the basis of publicly available information) comparing world countries by the level of economic security and giving an objective assessment of threats to the national economic interests with a sufficient degree of reliability.

We believe that it is expedient to form the system of indicators for assessment of a country's economic security, especially when it is necessary to perform various collations and comparisons, in accordance with the following principles: Representativeness (to include independent, the most significant indicators, which influence the level of economic security), authenticity (to include indicators, which adequately reflect the state of security components), and information accessibility (international indices and rankings could be used in calculations).

In the course of the study, we determined that individual indices used in the practice of assessment of economic security differ by methods of calculation but are similar in terms of economic content or calculated on the basis of other indices and indicators, i.e., are already dependent on them. Among the indices there are similar composite and individual indicators. Thus, the Corruption Perceptions Index [21], which is presented by the Transparency International non-governmental public organization, is often used in the world practice for assessing the level of corruption in a country. The goal of determination of this index is assessment of the expert perception of the incidence of corruption in the governmental sector of world countries. Results of this inquiry concerning the corruption perceptions are used by the World Bank in calculating the Worldwide Governance Indicators [22] and Doing Business index [23] as well as by an American research center The Heritage Foundation in cooperation with The Wall Street Journal for measuring the Index of Economic Freedom [24]. Also, the cases of building indices based on other indicators and indices are quite common. Thus, if studies of economic security are carried out taking into account such indicators and indices, the results obtained may be incorrect, due to the dependence and partial duplication of these indicators or indices. In addition, the estimates obtained on the basis of complex indicators and indices are quite generalized, while the development of a set of measures to ensure economic security requires both generalized and more

exact estimates, which can be obtained only on the basis of an analysis of individual sub-indicators characterizing specific threats to economic security.

That is why, in our view, when assessing economic security of a country with the aim of its deep analysis and development of respective measures for its ensuring, it is reasonable to use individual sub-indicators and components, as well as composite indicators formed on their basis rather than composite international indices.

It is necessary to note that the use of composite indicators for studying multidimensional phenomena (including economic security) is already widely used in different spheres of modern research (El Gibari et al., 2019 [25], Gryshova et al., 2020 [26], Gan et al., 2017 [27], Floridi et al., 2011 [28], Haustova and Omelchenko 2011 [29], and Zhou et al., 2010 [30]). Many scientific works confirm the expediency of using this approach (El Gibari et al., 2019 [25], Mazziotta and Pareto 2013 [31]) since composite indicators allow obtaining properly interpreted results under condition of correct development of these indices, which should be based on: Clear theoretical understanding of the studied phenomenon, justified selection of the group of sub-indicators, and their testing for multicollinearity, indicator normalization, and correct aggregation of sub-indicators (Mazziotta and Pareto 2013 [31]). The most widely used aggregation method is the additive method (Mazziotta and Pareto 2013 [31], Gan et al., 2017 [27]).

Thus, our research is aimed at developing a methodology for assessing and analyzing economic security of countries that is not difficult to apply; is based on a system of independent, representative indicators; assessment indicators should be available for analysis and correct comparison (presented in the annual official statistics for countries); will allow obtaining both generalized assessments of economic security by components (economic, political, etc.) and by individual indicators that reflect existing security threats; and will allow comparing countries in terms of level of economic security and effectiveness of government actions to maintain it to ensure sustainable development of countries.

In this study, economic security will be considered precisely in the plane of its providing sustainable development of a country, by which we mean sustainable development of a country as its balanced economic growth, which is accompanied with solving social problems of the population, inequality, and poverty in particular, which does not result in degradation of the environment.

3. Materials and Methods

The goal of this study is assessing the economic security of EU countries and Ukraine and verifying or refuting the hypothesis about the influence of economic security of world countries on their sustainable economic development.

The key questions raised in the study are as follows:

1. Which EU countries are leaders in terms of economic security, which ones are lagging behind in terms of this indicator, and what are the ranks of the countries that have recently joined the EU? Are the positions of countries in the ranking stable or have they changed over the past years?
2. Is it possible to classify EU countries into groups by the level of economic security and to which of the groups can Ukraine be assigned?
3. Is there a connection between the level of economic security of a country and its sustainable economic development?
4. Which components of the economic security of EU countries have the greatest impact on the level of their economic development?
5. Which individual indicators of the components of economic security have the greatest impact on the level of economic development of EU countries, and which of them should be of the primary concerns of the governments of the countries to ensure their economic security and sustainable development?

In order to achieve the set goal, we specified the following study tasks:

1. To formulate theoretical principles of assessment and analysis of the level of economic security of world countries.
2. To assess the level of economic security of EU countries and Ukraine (with the help of the composite indicator).
3. To perform the clustering of EU countries and Ukraine by the level of economic security and single out a group of countries that are homogeneous by their level and are characterized by close regularities of development. Also, to study how the composite indicator of economic security influences GDP per capita, as a generalized indicator of economic development (with the help of the cluster and regression analysis methods), and verify or refute the proposed study hypothesis.

Data of international indices and ratings formed the main sampling of the study of economic security of world countries and their influence on economic development.

The general study structure is presented in Table 1.

Table 1. The study structure.

Stage	Main Procedures	Study Materials and Methods
1. Generalization of theoretical principles of analysis and assessment of a country's economic security of	1.1. Specification of the interpretation of the 'national economic security' concept	<i>Methods:</i> analysis of literary sources; general scientific methods—analysis and synthesis, generalization <i>Analytical basis:</i> scientific publications on the analyzed problems
	1.2. Diagnosing the main threats to national economic security	<i>Methods:</i> general scientific methods—analysis and synthesis, generalization
2. Composite assessment of the level of economic security of EU countries and Ukraine	2.1. Formation of the structure of the composite indicator of economic security of a country	<i>Analytical basis:</i> results of the previous analysis (1.2) <i>Methods:</i> taxonomic analysis method, additive aggregation method
	2.2. Calculation of the composite indicator of economic security of EU countries and Ukraine	<i>Statistical basis:</i> data of international indices and rankings
3. Verification or refutation of the hypothesis about influence of economic security on economic development of Ukraine and EU countries	3.1. Division of EU countries and Ukraine by the composite indicator of economic security	<i>Methods:</i> grouping and classification <i>Statistical basis:</i> results of previous calculations (2.2)
	3.2. Building regression models of interconnection of the composite indicator of economic security and GDP per capita indicator for each cluster	<i>Methods:</i> regression modelling <i>Statistical basis:</i> results of previous calculations (2.2, 3.1)
	3.3. Analysis of influence of the level of economic security on economic development of EU countries and Ukraine	<i>Methods:</i> cluster analysis, regression modelling, correlation analysis <i>Statistical basis:</i> results of previous calculations (2.2, 3.1, 3.2)

Source: Developed by the authors.

Thus, the study is composed of three main parts.

The first one implies the formation of theoretical principles of the study. It rests upon analysis of works of scholars in the studied problems and is directed at justifying on this basis approaches to assessment and analysis of economic security of a country and diagnosis of the main threats that influence it.

The second part is directed at the calculation of the composite indicator of economic security. It is proposed to use the hierarchically built indicator system, which includes the composite indicator and sub-indicators (grouped by respective economic security components), as the foundation for assessing the level of economic security of a country.

The composite indicator of economic security of a country should be understood as a generalized macroeconomic indicator, which holistically characterizes the modern state of economic security of a country in the economic, social, political, and ecologic spheres. So, the composite indicator includes the economic, social, political, and ecologic components and is formed with the help of the taxonomic analysis method, which allows determining the level and disproportions of the country development and could be the basis for forming directions to support its economic security.

The third part of this study deals with the verification or refutation of the hypothesis about influence of the level of economic security on sustainable economic development of Ukraine and EU countries. The main study methods are the methods of cluster analysis and correlation-regression modelling.

Cluster analysis is the most popular instrument for performing object typologization. Its goal is classifying objects (in our study—countries) into relatively homogeneous groups with regard to the considered set of attributes (indicators, variables, etc.). Clustering methods are described in sufficient details in many scientific works and are widely used in economic studies. When clustering the countries by the level of national economic security, Euclidean distance is selected as the measure of distance between objects, and Ward's method is applied to measure the distance between clusters. Using cluster analysis for the purpose of the study should result in determining groups of countries that are homogeneous in terms of the level of economic security and have more similar development regularities.

Correlation-regression analysis is used for analyzing and modelling the interconnection between the composite indicator of economic security and GDP per capita level in the studied countries.

Correlation analysis is also used for assessing the influence of individual components of economic security on sustainable development of a country. The further analysis of correlation links between the GDP per capita and individual indicators, which are parts of the economic security components, is carried out for identifying those that should be of priority concern for the governments for increasing the level of economic security and respective increase in the GDP level. Since the purpose of the study was to identify the influence of the components of economic security on sustainable development of countries of the world, the reverse effect of the GDP level on the level of economic security was not studied separately. The construction of a complete diagram of the cause–effect relationships is the direction of our further research.

The proposed research methodology is the authors' development. It is based on using a complex of well-known analysis methods, data from international indices, and rankings for 29 countries (28 EU member states and Ukraine). To carry out calculations according to the methodology, StatSoft Statistica 8.0 (software developer – StatSoft Inc., Tulsa, Oklahoma, USA) was used.

4. Results

Let us verify or refute the hypothesis about the influence of economic security of world countries on their sustainable economic development in accordance with the study structure presented in Table 1.

Stage 1. Generalization of theoretical principles of analysis and assessment of a country's economic security.

As it was specified, clear theoretical understanding of the studied phenomenon is the key to its correct analysis. For this purpose, the first stage of the study structure (Table 1) envisages a more detailed interpretation of the 'national economic security' concept, diagnosis of the main threats to the national economic security for justifying the selection of a set of sub-indicators that characterize it, and their grouping by components.

Generalizing the results of studying the modern scientific literature, we can single out individual approaches to defining the 'economic security' concept: Resource and functional (ensuring a country's economic security is connected with efficient use of resources); protection of key (national) interests against threats (economic security is considered as the state of the national interests' being protected against the negative influence of external environment, with regard to timely prevention of various threats); provision of resilience and efficient development (economic security is considered as ensuring resilience and possibility of a country's development under conditions of influence of internal and external threats); and complex one (combines individual elements of both above mentioned approaches). Based on the analysis of interpretations of this concept, presented in scientific works and previous studies (Kyzym et al., 2018 [32], Hubarjeva 2015 [33], Khaustova and Grigorova-Berenda 2013 [4]), we propose the following interpretation of this concept: Economic security of a country is the state of the national economic interests' being protected from external and internal threats in the economic,

political, social, and ecologic spheres, which ensures independence of the national economy, its stability, resilience and capability for constant renewal and self-development.

As mentioned earlier, at present, researchers employ various methods and approaches to security assessment, which are based on indicative analysis, analysis of various kinds of quantitative and qualitative indicators, use of integral indicators and indices, etc. Many of them are built upon applying international indices and rankings. However, in our opinion, when assessing economic security of a country, it is advisable to use and analyze not composite international indices and rankings but individual sub-indicators that are considered in them. Since international indices and rankings are calculated annually for many countries of the world, these sub-indicators can form the basis for studying a country's economic security. It is the correct choice of the system of sub-indicators that is the key to obtaining its objective assessment. This system of indicators should take into account all threats to economic security; all indicators used should be independent, comparable, and representative. Thus, it is proposed to put the hierarchically built indicator system, which includes the composite indicator formed on the basis of sub-indicators that are grouped by components, in the foundation of assessing the level of a country's economic security.

Based on the analysis of studies on the problems of economic security and previous works [4,32,33], a classification of the most probable threats to a country's economy has been formed (Table 2).

Table 2. Classification of the most probable threats to the national economy.

Classification Feature	Threat Classes
Place of emergence	Internal, external
Degree of danger	Especially dangerous, dangerous
Probability of realization	Real, potential
Scale of action	National, regional, local, individual
Duration of action	Temporary, permanent; short-term and long-term
Area of action	Production, financial, export-import, technological, institutional, socio-economic, demographic-economic, military-economic, ecologic-economic, etc.
Character of action	Direct, indirect
Attitude to treats	Objective, subjective
Probability of emergence	Real and potential, hardly probable and highly probable
Possibility of control	Controlled, uncontrolled
Directionality	Personality, society, state
Nature of emergence	Natural, anthropogenic
Degree of perception	Overstated, adequate, understated, pretended
Sphere of manifestation	Economic, political, social, ecologic

Source: Developed by the authors.

Thus, economic security of a country is influenced by threats that manifest themselves in all spheres of public life. Therefore, to comprehensively manage a country's economic security system in order to ensure its sustainable development, when assessing security, we consider it important taking into account the following classes of threats: Economic, political, social, and environmental ones.

Stage 2. Composite assessment of the level of economic security of EU countries and Ukraine.

According to the study structure (Table 1), this stage envisages forming the structure of the composite indicator of a country's economic security and calculating the composite indicator of economic security of EU countries and Ukraine.

As it was proved before, the formation of the system of sub-indicators for assessing a country's economic security should be carried out in accordance with the principles of representativeness, authenticity, and information accessibility.

In order to form the system of indicators for assessing the level of a country's economic security, in the study, we analyzed the composition of sub-indicators applied by well-known international indices and rankings: The Global Competitiveness Index [34]; Index of Economic Freedom [35]; the Global Enabling Trade Index [36]; the Fragile States Index [37]; KOF Index of Globalization [38]; Human Development Index [39]; World Happiness [40]; Doing Business [23];

the Worldwide Governance Indicators [22]; the Democracy Index [41]; Corruption Perceptions Index [21]; the Legatum Prosperity Index [42]; and the Environmental Performance Index [43]. We considered their correspondence with the above-listed principles and main threats to economic security and removed the similar ones. As a result, we selected the sub-indicators that more clearly characterize individual components of a country's economic security. The selected indicators were checked for absence of multicollinearity. In forming the system of indicators for assessing the level of a country's economic security, only those of them the coefficient of correlation between which did not exceed 0.7 were selected. This is explained by the fact that if the correlation coefficient is more than 0.7, the connection between the indicators according to the Chaddock scale could be estimated as high.

Thus, to avoid the enhanced effect when calculating the composite indicator of a country's economic security, the correlation analysis was used for checking the density of statistical connections between the numerical series for the selected indicators that could be used for assessing a country's economic security.

The composition of the selected sub-indicators allowed for their distribution by components: Economic, political, social, and ecologic.

So, the structure of the economic security composite indicator is proposed in this study (Table 3).

Taxonomic analysis and additive aggregation methods were used in this study to calculate the composite indicator of economic security of EU countries and Ukraine.

A characteristic feature of the taxonomic composite indicator is that its value is within the interval from 0 to 1. This indicator can be interpreted as follows: It acquires high values when indicators in the system approach the reference element and low values in case they become more distant (Mazur-Wierzbicka 2018 [44], Haustova and Omelchenko 2011 [29], Dunn and Everitt 1982 [45]). The additive aggregation method is used for the so-called aggregation of sub-indicators. The method employs functions that sum up the normalized values of sub-indicators to form a composite indicator (Kyzym et al., 2018 [32], Gan et al., 2017 [27], Khaustova and Grigorova-Berenda 2013 [4], Haustova and Omelchenko 2011 [29]).

The standardization of data for the calculation of composite indicators by security components was carried out as follows:

$$x_{ij}^{st} = \begin{cases} \frac{x_{ij} - \min_j x_{ij}}{\max_j x_{ij} - \min_j x_{ij}}, & \text{if } j\text{-th indicator promotes the security level (simulator)} \\ \frac{\max_j x_{ij} - x_{ij}}{\max_j x_{ij} - \min_j x_{ij}}, & \text{otherwise, (distimulator)} \end{cases} \quad (1)$$

where x_{ij}^{st} is standardized value of the j -th indicator for the i -th country;

x_{ij} is raw value of the j -th indicator for the i -th country.

The reason for selecting this approach is that the variation of values of some indicators was so large that the negative standardized values, obtained with the help of other methods, did not allow calculating the composite indicator using the geometric mean even provided the modification that was applied for calculating estimates of the components:

$$I_i^k = n_k \sqrt{\prod_{j=1}^{n_k} (1 + x_{ij}^{st})} - 1 \quad (2)$$

where I_i^k is composite indicator of security of the i -th country by the k -th component ($k = 1$ corresponds to the economic component, $k = 2$ —social, and $k = 3$ —political one), n_k is the number of raw values of security indicators for the k -th component.

General composite assessment of the security level was calculated as the geometric mean without modification, since all component assessments were strictly positive:

$$I_i = 3 \sqrt{\prod_{k=1}^3 I_i^k} \quad (3)$$

where I_i —composite indicator of security of the i -th country.

Table 3. Structure of the composite indicator for assessment of economic security of world countries.

Components	Sub-Indicators	Source	
Complex indicator of national economic security	Macroeconomic stability	The Global Competitiveness Index [34]	
	Infrastructure		
	Product market		
	Labor market		
	Financial system		
	Market size		
	Economic	Innovation capability	Index of Globalization [38]
		Economic globalization	The Fragile States Index [37]
		Economic decline	
		Uneven development	The Legatum Prosperity Index [42]
		Business environment	
		Economic quality	
	Social	Healthy life expectancy	The Global Competitiveness Index [34]
		Education	
		Social capital	Index of Globalization [38]
		Social globalization	
		Demographic pressures	The Fragile States Index [37]
		Refugees and IDPs	
Human flight & brain drain			
Health	The Legatum Prosperity Index [42]		
Natural environment			
Political	Income inequality	Human Development Index [39]	
	Employment		
	Socioeconomic sustainability		
	Gender inequality		
	Security	The Global Competitiveness Index [34]	
	Incidence of corruption		
	Future orientation of government		
	Business dynamism		
	Political globalization	Index of Globalization [38]	
	Security apparatus	The Fragile States Index [37]	
	Factionalized elites		
	External intervention		
Public services			
Ecologic	Human rights & rule of law	The Legatum Prosperity Index [42]	
	Governance		
	Environmental performance	Environmental Performance Index [43]	

The results of calculating composite indicators of economic security of world countries by components and in general are presented in Table 4.

Table 4. Composite assessment of economic security of world countries by components and in general.

Countries	Estimates					Rankings				
	Economic	Social	Political	Ecologic	Composite Security	Economic	Social	Political	Ecologic	Composite Security
2016										
Austria	0.676	0.704	0.863	0.632	0.717	9	8	5	12	7
Belgium	0.645	0.668	0.745	0.042	0.494	11	11	10	28	20
Bulgaria	0.323	0.400	0.311	0.338	0.342	24	27	28	23	27
Great Britain	0.666	0.729	0.810	0.700	0.725	10	6	9	10	5
Greece	0.169	0.388	0.394	0.557	0.370	28	28	25	15	25
Denmark	0.794	0.759	0.872	0.866	0.822	4	2	4	3	3
Estonia	0.683	0.545	0.595	0.810	0.655	8	19	16	7	10
Ireland	0.700	0.723	0.830	0.629	0.719	7	7	7	13	6
Spain	0.415	0.634	0.627	0.839	0.622	21	14	15	5	15
Italy	0.298	0.423	0.496	0.436	0.411	25	24	21	21	23
Cyprus	0.413	0.521	0.400	0.050	0.333	22	20	24	27	28
Latvia	0.484	0.510	0.446	0.548	0.496	15	22	22	16	19
Lithuania	0.431	0.595	0.524	0.528	0.518	18	15	20	17	17
Luxembourg	0.858	0.678	0.822	0.627	0.744	1	10	8	14	4
Malta	0.616	0.519	0.640	0.800	0.640	12	21	14	8	13
The Netherlands	0.817	0.763	0.901	0.213	0.649	2	1	2	25	11
Germany	0.709	0.690	0.855	0.416	0.660	6	9	6	22	9
Poland	0.428	0.550	0.537	0.143	0.404	20	18	18	26	24
Portugal	0.464	0.639	0.682	0.813	0.645	16	13	12	6	12
Romania	0.272	0.412	0.385	0.323	0.347	26	25	27	24	26
Slovakia	0.430	0.570	0.525	0.521	0.511	19	17	19	18	18
Slovenia	0.462	0.586	0.678	0.845	0.637	17	16	13	4	14
Hungary	0.396	0.498	0.387	0.447	0.431	23	23	26	20	21
Finland	0.765	0.756	0.949	1.000	0.864	5	3	1	1	1
France	0.535	0.642	0.743	0.774	0.671	14	12	11	9	8
Croatia	0.248	0.402	0.436	0.663	0.430	27	26	23	11	22
Czech Republic	0.572	0.744	0.594	0.453	0.587	13	4	17	19	16
Sweden	0.799	0.736	0.892	0.977	0.849	3	5	3	2	2
Ukraine	0.107	0.270	0.110	0.000	0.118	29	29	29	29	29
2017										
Austria	0.727	0.795	0.807	0.840	0.775	7	8	6	7	7
Belgium	0.675	0.728	0.742	0.789	0.714	10	10	11	12	10
Bulgaria	0.306	0.310	0.368	0.482	0.327	26	27	28	20	26
Great Britain	0.720	0.813	0.777	0.869	0.769	8	6	7	5	8
Greece	0.216	0.388	0.412	0.667	0.326	28	25	26	15	27
Denmark	0.838	0.898	0.918	0.924	0.884	1	1	2	2	1
Estonia	0.616	0.542	0.594	0.368	0.583	12	19	17	27	17
Ireland	0.690	0.830	0.763	0.833	0.759	9	5	8	8	9
Spain	0.511	0.667	0.603	0.821	0.590	17	12	15	10	16
Italy	0.429	0.434	0.496	0.775	0.452	21	24	21	13	22
Cyprus	0.407	0.598	0.373	0.635	0.449	23	17	27	16	23
Latvia	0.449	0.454	0.479	0.426	0.460	19	23	22	23	21
Lithuania	0.428	0.466	0.530	0.530	0.473	22	22	19	19	20
Luxembourg	0.831	0.812	0.751	0.845	0.797	3	7	9	6	6
Malta	0.591	0.665	0.605	0.902	0.620	13	13	14	3	13
The Netherlands	0.836	0.845	0.877	0.727	0.853	2	2	3	14	2
Germany	0.761	0.788	0.875	0.820	0.806	6	9	5	11	5
Poland	0.457	0.501	0.552	0.362	0.502	18	20	18	28	19
Portugal	0.539	0.621	0.704	0.613	0.618	16	16	13	17	14
Romania	0.335	0.347	0.440	0.383	0.371	25	26	23	26	25
Slovakia	0.436	0.568	0.520	0.570	0.505	20	18	20	18	18
Slovenia	0.555	0.644	0.704	0.473	0.631	15	15	12	22	12
Hungary	0.401	0.476	0.414	0.391	0.429	24	21	25	25	24
Finland	0.789	0.843	0.922	0.829	0.850	5	3	1	9	3
France	0.621	0.658	0.746	1.000	0.673	11	14	10	1	11
Croatia	0.269	0.296	0.425	0.405	0.323	27	28	24	24	28
Czech Republic	0.577	0.682	0.596	0.477	0.617	14	11	16	21	15
Sweden	0.813	0.843	0.875	0.889	0.843	4	4	4	4	4
Ukraine	0.094	0.128	0.081	0.000	0.099	29	29	29	29	29

Table 4. Cont.

Countries	Estimates					Rankings				
	Economic	Social	Political	Ecologic	Composite Security	Economic	Social	Political	Ecologic	Composite Security
2018										
Austria	0.750	0.615	0.794	0.912	0.764	7	12	6	5	7
Belgium	0.669	0.652	0.752	0.721	0.698	10	5	10	11	10
Bulgaria	0.389	0.348	0.368	0.227	0.331	25	27	27	28	28
Great Britain	0.688	0.642	0.744	0.964	0.755	9	7	11	3	8
Greece	0.233	0.435	0.357	0.594	0.399	28	20	28	17	26
Denmark	0.858	0.677	0.916	1.000	0.859	1	3	2	1	1
Estonia	0.650	0.390	0.629	0.479	0.533	11	23	14	20	18
Ireland	0.695	0.620	0.771	0.706	0.697	8	10	7	12	11
Spain	0.537	0.745	0.615	0.752	0.660	16	1	15	10	12
Italy	0.438	0.581	0.502	0.652	0.541	23	15	21	14	17
Cyprus	0.440	0.476	0.383	0.464	0.440	22	17	26	21	21
Latvia	0.520	0.362	0.517	0.367	0.439	18	25	18	26	22
Lithuania	0.492	0.382	0.543	0.406	0.454	19	24	17	25	20
Luxembourg	0.854	0.690	0.759	0.994	0.821	2	2	9	2	2
Malta	0.629	0.621	0.507	0.642	0.599	12	9	20	16	15
The Netherlands	0.846	0.619	0.901	0.782	0.784	3	11	3	9	5
Germany	0.757	0.604	0.877	0.839	0.766	6	13	4	8	6
Poland	0.471	0.405	0.497	0.345	0.428	21	22	22	27	23
Portugal	0.535	0.648	0.727	0.530	0.608	17	6	12	19	14
Romania	0.359	0.357	0.437	0.461	0.402	27	26	23	22	25
Slovakia	0.485	0.440	0.517	0.570	0.502	20	19	19	18	19
Slovenia	0.578	0.512	0.717	0.682	0.620	15	16	13	13	13
Hungary	0.429	0.406	0.395	0.430	0.415	24	21	24	23	24
Finland	0.798	0.664	0.935	0.891	0.819	5	4	1	6	3
France	0.612	0.634	0.764	0.924	0.729	13	8	8	4	9
Croatia	0.372	0.336	0.391	0.412	0.378	26	28	25	24	27
Czech Republic	0.592	0.454	0.598	0.652	0.572	14	18	16	14	16
Sweden	0.802	0.597	0.877	0.885	0.786	4	14	5	7	4
Ukraine	0.110	0.176	0.068	0.000	0.086	29	29	29	29	29

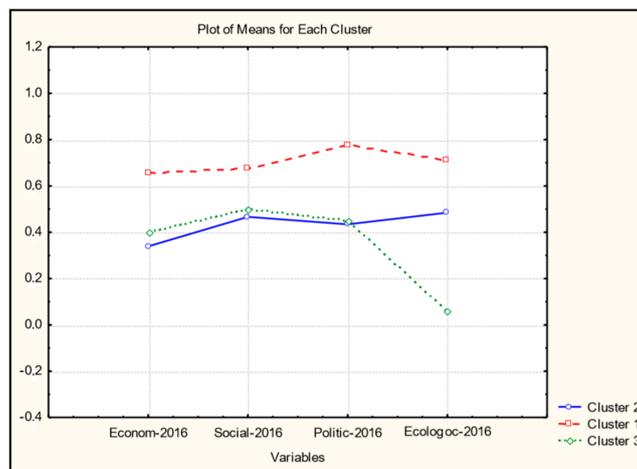
It should be noted that since the calculation of Composite Security was carried out using the geometric mean, the result is always less than the sum (and the arithmetic mean) of the parts. In addition, large values of estimates of individual components are compensated by smaller (sometimes much smaller) estimates for other components, therefore the complex estimate is less than those of individual components.

Stage 3. Verification or refutation of the hypothesis about influence of economic security on economic development of Ukraine and EU countries.

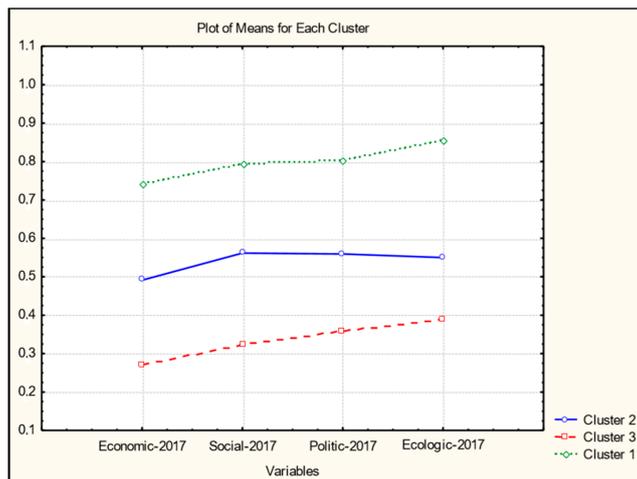
At this stage, the study structure (Table 1) implies dividing EU countries and Ukraine by the composite indicator of economic security, constructing regression models of interconnection of the composite indicator of economic security and GDP per capita (as a generalized economic development indicator) for every cluster, and analyzing the influence of the economic security level on economic development of EU countries and Ukraine.

Any country has its specific features; however, as it is known, objects (countries) in a homogeneous group are characterized by more similar regularities of development. The above study showed that the analyzed countries cannot be assigned to one cluster. For ranking and breaking the countries into homogeneous clusters by economic security level, cluster analysis was applied in the study. The clustering was carried out employing the method of k-means on the basis of Euclidean metric, with the use of Statistica 8.0 application software package. To determine the number of clusters, we carried out a number of experiments, the results of which proved that the division into three clusters was most reasonable since, in this case, firstly, the average values of the composite indicators for the clusters were divided in the best way (Figure 1); and, secondly, it was determined that the intragroup dispersion for all indicators was significantly lower than the intergroup dispersion, and the differences between the estimates of the intragroup and intergroup dispersion were determined as statistically significant (Table 5). As follows from Figure 1 and Table 5, the clusters differed least in terms of values of the economic and social components of economic security (Table 5), but in this case, the intergroup

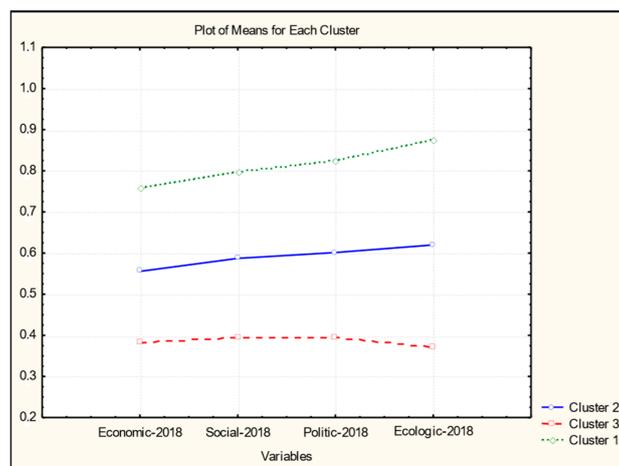
dispersion turned out to be greater than the intragroup dispersion, and their difference is statistically significant (Table 5, $p < 0.001$).



(a)



(b)



(c)

Figure 1. Charts of the mean values of economic security components by clusters: (a)—2016; (b)—2017; (c)—2018. Source: Calculated by the authors.

Table 5. Estimates of the intragroup and intergroup dispersion according to the clusterization results by years.

Variable	Intergroup Dispersion (Between SS)	Degree of Freedom (Df)	Intragroup Dispersion (Within SS)	Degree of Freedom (Df)	F-Test (F)	Statistical Significance (Signif. p)
2016 (a)						
Economic-2016	0.659563	2	0.511835	26	16.75210	0.000021
Social-2016	0.291628	2	0.223177	26	16.98725	0.000019
Political-2016	0.800433	2	0.468853	26	22.19379	0.000002
Ecologic-2016	1.424968	2	0.773693	26	23.94309	0.000001
2017 (b)						
Economic-2017	0.945786	2	0.186382	26	65.96799	0.000000
Social-2017	0.918199	2	0.205291	26	58.14477	0.000000
Political-2017	0.867300	2	0.282376	26	39.93012	0.000000
Ecologic-2017	1.028262	2	0.521759	26	25.61988	0.000001
2018 (c)						
Economic-2018	0.742313	2	0.246080	26	39.21523	0.000000
Social-2018	0.849347	2	0.198582	26	55.60189	0.000000
Political-2018	0.974545	2	0.270241	26	46.88068	0.000000
Ecologic-2018	1.330635	2	0.389760	26	44.38184	0.000000

Source: Calculated by the authors.

The analysis of charts of mean values (Figure 1) and intragroup and intergroup dispersion (Table 5) allowed making a conclusion regarding a high-quality division of countries into clusters. According to the obtained data, the first cluster of countries is the best in terms of all components, countries in the second cluster demonstrate average results, and the third cluster countries demonstrate the worst results.

Comparison of the clusterization results for three years allowed for drawing a conclusion regarding sufficient stability of the world countries in terms of the security components and composite assessment (Tables 6 and 7).

Table 6. Stability of the country groups by clusters.

Countries	Stability of Clustering			Countries	Stability of Clustering		
	2016	2017	2018		2016	2017	2018
Austria	1	1	1	Slovenia	1	2	2
Great Britain	1	1	1	Czech Republic	2	2	2
Denmark	1	1	1	Italy	2	2	2
Ireland	1	1	1	Slovakia	2	2	2
Luxembourg	1	1	1	Latvia	2	2	3
The Netherlands	1	1	1	Lithuania	2	2	3
Germany	1	1	1	Cyprus	3	2	3
Finland	1	1	1	Poland	3	2	3
France	1	1	1	Bulgaria	2	3	3
Sweden	1	1	1	Greece	2	3	3
Belgium	3	1	1	Romania	2	3	3
Malta	1	1	2	Hungary	2	3	3
Estonia	1	2	2	Croatia	2	3	3
Spain	1	2	2	Ukraine	3	3	3
Portugal	1	2	2				

Source: Calculated by the authors.

Table 7. Mean values of the security components.

Clusters	Years	Economic	Social	Political	Ecologic	Composite Security
1	2016	0.658	0.678	0.772	0.712	0.700
	2017	0.741	0.793	0.805	0.856	0.778
	2018	0.757	0.798	0.826	0.874	0.771
2	2016	0.339	0.466	0.434	0.484	0.429
	2017	0.491	0.562	0.559	0.550	0.535
	2018	0.555	0.587	0.601	0.620	0.579
3	2016	0.398	0.502	0.448	0.059	0.337
	2017	0.270	0.324	0.356	0.388	0.312
	2018	0.381	0.396	0.396	0.371	0.377

Source: Calculated by the authors.

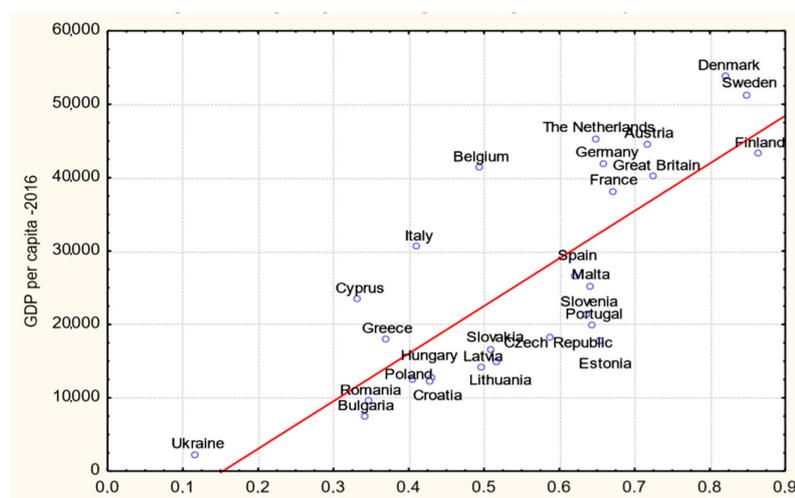
So, according to the results obtained, the first cluster is formed by the countries that are leaders in providing economic security: Austria, Great Britain, Denmark, Ireland, Luxemburg, Netherlands, Germany, Finland, France, and Sweden. The only representative of the first cluster that has the highest values of composite indicators by all components is Denmark. Belgium was included in the third cluster, due to ecologic problems in 2016, but became a representative of the first cluster starting from 2017.

The second cluster includes countries that have average values of composite indicators in terms of economic security components. The cluster includes Malta, Portugal, Spain, and Italy along with the newly accepted EU member states: Czech Republic, Estonia, Slovenia, and Slovakia. Lithuania, Latvia, Poland, and Cyprus were not assigned to this cluster due to deterioration in their positions in 2018.

The third cluster includes countries with a low level of the national economy security development: Latvia, Lithuania, Cyprus, Poland, Bulgaria, Greece, Romania, Hungary, and Croatia. A characteristic feature of the countries from this cluster is low values of all four components of the composite indicator of a country's economic security level. Ukraine, according to its values, also belongs to the third cluster.

The graphical analysis of interconnection between the composite indicator of economic security and level of GDP per capita by countries (Figure 2) testifies to the existence of the connection and possibility of building a regression model. It should be noted that Table 8 and further calculations do not include Ireland and Luxemburg since the level of GDP per capita in these countries exceeds the highest level of other countries several times, which is explained by specific economic conditions of these countries.

Scatterplot of GDP per capita—2016 against Composite_Security—2016

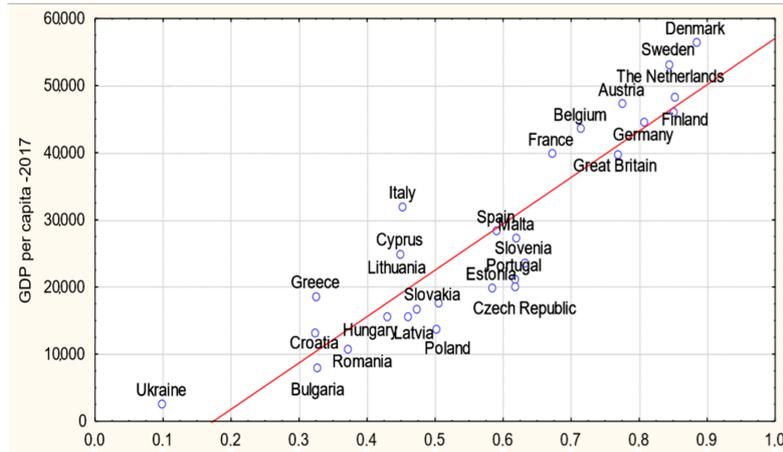


$$\text{Composite_Security—2016: GDP per capita—2016: } y = -9907.8294 + 64836.1973 \times x; R^2 = 0.6180.$$

(a)

Figure 2. Cont.

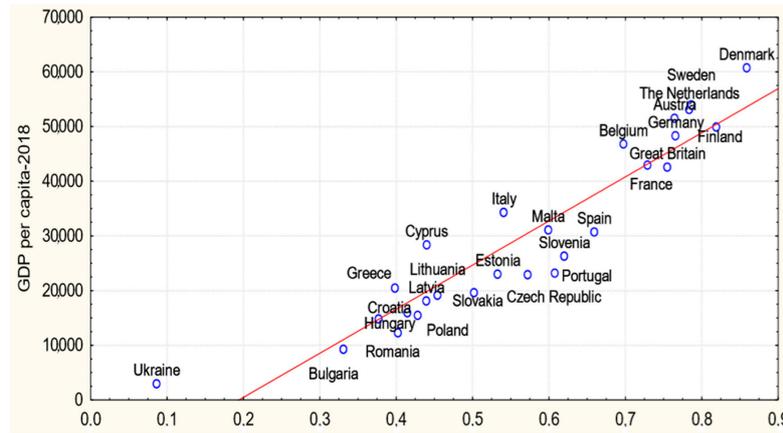
Scatterplot of GDP per capita—2017 against Composite_Security—2017



Composite_Security—2017: GDP per capita—2017: $y = -12026.0889 + 69071.9892 \times x$; $R^2 = 0.8246$.

(b)

Scatterplot of GDP per capita—2018 against Composite_Security—2018



Composite_Security—2018: GDP per capita—2018: $y = -15652.4419 + 80648.2554 \times x$; $R^2 = 0.8741$.

(c)

Figure 2. Scatterplot of the composite security indicator against GDP per capita by years: (a)—2016; (b)—2017; (c)—2018. Source: Calculated by the authors.

The linear regression models were built separately for each year and for three years in total. The results of the built models for each year are shown in Table 8. Moreover, taking into account a significant difference in the values of the composite security indicator by country groups, an assumption was made that the dependence models could be different for each group. This assumption turned out to be wrong since the models built separately for each group proved to be inadequate and their parameters statistically insignificant with one exception. As evidenced by the results shown in Table 8, all constructed models are adequate in terms of the coefficient of determination R^2 (from 0.62 to 0.91), statistically significant in general (according to the F-test with a confidence level of $p < 0.000001$). In addition, the parameters of the models that correspond to the independent variable—the composite indicator of economic security—are also statistically significant (according to the Student’s test with a confidence level of $p < 0.000001$).

As it is seen in Figure 2a, the regression line, which was built for all countries for 2016, practically divided them into two groups. One of the groups is mainly composed of the first cluster countries and some of the second cluster countries. That is why a model, which used the visible

division into two groups as a dummy variable, was built. The results of the built regression turned out to be better than they were without taking into account this effect (see Table 8).

The correlation analysis (Table 9) was conducted for assessing the influence of individual security components. This analysis showed that all components have a significant and stable impact on a country's GDP level. Furthermore, the economic component has the consistently biggest influence while the role of the social and ecologic components sometimes increases and that of the political one slightly decreases.

Table 8. Assessments of regression models of dependence of GDP per capita on the economic security composite indicator by years *.

(a). Regression Summary, 2016						
N = 27	Regression Summary for Dependent Variable: GDP per capita—2016					
	R = 0.78609826 F(1,25) = 40.437		R ² = 0.61795047 p < 0.00000		Adjusted R ² = 0.60266849 Std. Error of estimate: 9272.6	
	Exclude cases: 8; 14; 37; 43; 66; 72					
	Beta	Std. Err. of Beta	B	Std. Err. of B	t(25)	p-level
Intercept			−9907.83	5919.77	−1.67368	0.106661
Compos_Security-2016	0.786098	0.123620	64826.20	10194.44	6.35897	0.000001
(a.1) Regression Summary, 2016						
N = 27	Regression Summary for Dependent Variable: GDP per capita—2016					
	R = 0.95439580 F(2,24) = 122.64		R ² = 0.91087134 p < 0.00000		Adjusted R ² = 0.90344396 Std. Error of estimate: 4571.0	
	Exclude cases: 8; 14; 37; 43; 66; 72					
	Beta	Std. Err. of Beta	B	Std. Err. of B	t(24)	p-level
Intercept			−6798.79	2939.144	−2.31319	0.029597
Compos_Security-2016	0.536420	0.067112	44236.30	5534.454	7.99289	0.000000
d1	0.596037	0.067112	17219.89	1938.912	8.88121	0.000000
(b) Regression Summary, 2017						
N = 27	Regression Summary for Dependent Variable: GDP per capita—2017					
	R = 0.90810158 F(1,25) = 117.57		R ² = 0.82464847 p < 0.00000		Adjusted R ² = 0.81763441 Std. Error of estimate: 6467.4	
	Exclude cases: 8; 14; 37; 43; 66; 72					
	Beta	Std. Err. of Beta	B	Std. Err. of B	t(25)	p-level
Intercept			−12026.1	3872.643	−3.10540	0.004681
Compos_Security-2017	0.908102	0.083750	69072.0	6370.189	10.84301	0.000000
(c) Regression Summary, 2018						
N = 27	Regression Summary for Dependent Variable: GDP per capita—2018					
	R = 0.93491626 F(1,25) = 173.52		R ² = 0.87406842 p < 0.00000		Adjusted R ² = 0.86903115 Std. Error of estimate: 5765.0	
	Exclude cases: 8; 14; 37; 43; 66; 72					
	Beta	Std. Err. of Beta	B	Std. Err. of B	t(25)	p-level
Intercept			−15652.4	3657.473	−4.27958	0.000241
Compos_Security-2018	0.934916	0.070974	80648.3	6122.370	13.17272	0.000000
(d) Regression summary 2016–2018						
N = 81	Regression Summary for Dependent Variable: GDP per capita					
	R = 0.87524710 F(1,79) = 258.69		R ² = 0.76605748 p < 0.00000		Adjusted R ² = 0.76309618 Std. Error of estimate: 7388.9	
	Exclude cases: 8; 14; 37; 43; 66; 72					
	Beta	Std. Err. of Beta	B	Std. Err. of B	t(79)	p-level
Intercept			−12571.4	2652.308	−4.73981	0.000009
Compos_Security	0.875247	0.054418	71642.9	4454.340	16.08384	0.000000

*— The results in the table are presented as they were generated by the Multiple Regression module of StatSoft Statistica 8.0. Source: Calculated by the authors.

Table 9. Correlation between the estimates of security components and GDP per capita by years.

Components	Economic	Social	Political	Ecologic
2016	0.78	0.67	0.77	0.29
2017	0.80	0.78	0.72	0.72
2018	0.79	0.77	0.71	0.79

Source: Calculated by the authors.

The further analysis of the correlation between the level of GDP per capita and values of individual indicators that comprise the economic security components allows for identifying those that should be of the first priority for the governments of the third cluster countries in the context of improvement of the national economic security level and a corresponding increase in GDP. Tables 10–12 present generalized results of the correlation analysis, which testify to the availability of a stable (in time) influence on GDP. Specifically, among the sub-indicators, almost all economic components consistently affect the size of GDP, with the exception of dependence on import. As to the social component, only the influence of the number of Refugees and IDPs is weak, and that of Employment is less than the average. Among the particular indicators of the political component, only political globalization has no effect on GDP, while the influence of the rest is stable and above average.

Table 10. Correlation between sub-indicators of the economic component and GDP per capita by years.

Years	Sub-Indicators of the Economic Component of Composite Security											
	Infra-Structure	Macro-Economic Stability	Product Market	Labour Market	Financial System	Market Size (Dependence on Import)	Innovation Capability	Economic Globaliza-tion	Economic Decline	Uneven Development	Business Environment	Economic Quality
2016	0.664	0.433	0.787	0.630	0.508	0.130	0.762	0.593	−0.745	−0.665	−0.617	−0.724
2017	0.570	0.459	0.745	0.691	0.740	0.166	0.726	0.547	−0.746	−0.658	−0.586	−0.724
2018	0.535	0.454	0.747	0.667	0.731	0.144	0.714	0.594	−0.745	−0.597	−0.570	−0.602

Source: Calculated by the authors.

Table 11. Correlation between sub-indicators of the social component and GDP per capita by years.

Years	Sub-Indicators of the Social Component of Composite Security											
	Health/Life Expectancy	Education	Social Capital	Social Globaliza-tion	Demographic Pressures	Refugees and IDPs	Human Flight & Brain Drain	Health	Natural Environment	Income Inequality	Employment	Socioeconomic Sustainability/Qualified Labour Force
2016	0.293	0.280	−0.705	0.516	−0.489	−0.223	−0.690	−0.716	−0.507	0.799	0.365	0.301
2017	0.635	0.613	0.723	0.795	−0.568	−0.243	−0.674	−0.696	−0.534	0.740	0.347	0.332
2018	0.584	0.645	0.733	0.801	−0.474	−0.246	−0.698	−0.634	−0.747	0.652	0.309	−0.229

Source: Calculated by the authors.

Table 12. Correlation between sub-indicators of the political component and GDP per capita by years.

Years	Sub-Indicators of the Political Component of Composite Security										
	Security	Incidence of Corruption	Future Orientation of Government	Business Dynamism	Political Globalization	Security Apparatus	Factionalized Elites	External Intervention	Public Services	Human Rights& Rule of Law	Governance
2016	0.455	0.779	0.782	0.772	0.247	−0.482	−0.507	−0.628	−0.637	−0.691	−0.695
2017	0.594	0.779	0.775	0.602	−0.021	−0.479	−0.509	−0.643	−0.649	−0.658	−0.694
2018	0.533	0.760	0.770	0.597	−0.055	−0.421	−0.503	−0.649	−0.641	−0.628	−0.748

Source: Calculated by the authors.

The conducted analysis allows recommending the third cluster countries (including Ukraine), which are characterized by the lowest level of the national economic security in terms of all components, to concentrate on the following improvements:

In the economic area—improving competition in the product market, ability to innovate, quality of the financial system, business environment, economic quality, and reducing the possibility of economic decline;

In the social dimension—improving social capital, social globalization, natural environment, and reducing income inequality and human flight and brain drain;

In terms of the political component—improving the quality of government, its stability and future orientation, and reducing incidence of corruption;

In terms of the ecologic component—improving environmental performance.

5. Conclusions

Thus, the study made it possible to assess the level of economic security of EU countries and Ukraine and verify the hypothesis about the influence of economic security of world countries on their sustainable economic development.

According to the methodology proposed, assessing the level of economic security of EU countries and Ukraine is based on an approach that implies measuring the composite indicator of economic security, which comprises a set of sub-indicators grouped by components—economic, social, political, and ecological. The assessment conducted on the basis of the proposed composite indicator allowed for ranking the considered countries in terms of the level of economic security in 2016–2018 both in general and by components. The assessment of the level of economic security of EU countries for 2016–2018 showed that the five countries with the highest level of economic security in 2018 were Denmark, Luxembourg, Finland, Sweden, and the Netherlands. Denmark occupied the first place in terms of this indicator for the last two years of the studied period. The positions of the countries in the ranking were not stable, but there were no significant changes in them. Ukraine, in comparison with the countries analyzed, had a significantly lower level of economic security during all these years.

The further research confirmed the possibility of classifying EU countries and Ukraine into three clusters, which have close levels of economic security and more similar development regularities. According to the results obtained, the best (in terms of all components) is the first cluster countries, the second cluster countries demonstrate average results, and the third cluster countries demonstrate the worst results. The first cluster was formed by the countries that are leaders in providing economic security: Austria, Great Britain, Denmark, Ireland, Luxemburg, Netherlands, Germany, Finland, France, and Sweden. Denmark is the only representative of the first cluster that had high values of composite indicators for all components. Belgium, due to the presence of environmental problems in 2016, was in the third cluster, but, since 2017, it again was assigned to the first cluster. The second cluster includes Malta, Portugal, Spain, Italy, and also the newly accepted EU member states: Czech Republic, Estonia, Slovenia, and Slovakia. Lithuania, Latvia, Poland, and Cyprus were not assigned to this cluster due to deterioration in their positions in 2018. The third cluster includes countries with a low level of security of the national economy: Latvia, Lithuania, Cyprus, Poland, Bulgaria, Greece, Romania, Hungary, and Croatia. A characteristic feature of the countries that fell into this cluster is the low values of all four components of the composite indicator of the security level of the country's economy. Ukraine, according to its indicators, also got into the third cluster.

In order to verify the hypothesis of this study about the influence of the level of countries' economic security on their sustainable economic development, regression models of interconnection of the composite indicator of economic security and GDP per capita were built by years and in general for the entire sample of countries for three years. The constructed models showed the presence of a significant relationship between the indicators and allowed us to confirm the hypothesis of our study.

To determine which components of economic security of the studied countries have the greatest impact on the level of their economic development, a correlation analysis was conducted. It is shown

that all components have significant stable influence on a country's GDP. Furthermore, the economic component has the consistently biggest influence while the role of the social and ecologic components sometimes increases and that of the political one slightly decreases.

To highlight the main areas of efforts by the governments of countries to maintain/improve the level of their economic security and economic development, an analysis of the correlations between the level of GDP per capita and individual indicators that are part of the components of economic security was carried out. For the countries of the third cluster (which includes Ukraine), the analysis showed that almost all sub-indicators included in the economic component consistently affect the size of GDP, with the exception of dependence on import. These sub-indicators are Infrastructure, Macroeconomic stability, Product market, Labor market, Financial system, Innovation Capability, Economic globalization, Economic decline, Uneven development, Business environment, and Economic quality. As for the social component, only the influence of the number of Refugees and IDPs is weak, and that of Employment is less than the average. Among the indicators that have a significant influence, there are Health/life expectancy, Education, Social capital, Social globalization, Demographic pressures, Human flight and brain drain, Health, Natural environment, and Income inequality. Among the particular indicators of the political component, only political globalization has no effect on GDP, while the influence of the rest is stable and above average. The indicators that have a significant influence are Security, Incidence of corruption, Future orientation of government, Business dynamism, Political globalization, Security apparatus, Factionalized elites, External intervention, Public services, Human rights and rule of law, and Governance. Thus, it is recommended for countries of the third cluster (including Ukraine), considering the strongest influence of the economic component on the economic security and economic development of countries of all clusters, to first of all concentrate on economic improvements, in particular: Improvement of the innovation capability, quality of the financial system and development of the goods market; reduction of the possibility of economic decline; and improvement of business environment and economic quality.

Thus, the study made it possible to solve the questions raised. The results obtained according to the methodology proposed in the study can serve as a guideline for the development of measures to ensure the economic security of the considered countries as well as the basis for further developments to form the state policy of Ukraine, taking into account the practices of EU countries in this area. This will require a further in-depth analysis of the country's problems and opportunities in certain areas that are important for ensuring economic security for the development of a set of measures to improve its level.

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