STUDY OF GLOBAL TRENDS IN ECONOMIC PROTECTION OF ENTERPRISES: BIBLIOMETRIC ANALYSIS, GRAPHIC VISUALIZATION AND FORECASTING

ABSTRACT

Introduction. In order to ensure the operation of the system of economic protection of the enterprise in the conditions of military aggression of the Russian Federation, a full-scale invasion of the territory of Ukraine and martial law, the article emphasizes the need to study the theoretical foundations of the problem.

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Purpose. The article conducts a study of global trends in economic protection of the enterprise, using means of bibliometric analysis, formation of bibliometric networks, economic and mathematical methods of forecasting, means of comparison and graphical visualization of the obtained results.

Method (methodology). To achieve these goals, bibliometric analysis of the Scopus database, correlation-regression analysis and forecasting based on a trend model using MS Excel were used. Visualization of the bibliometric analysis was implemented using the VOSviewer and an online service designed for the construction of the Sankey diagram.

Results. According to the results of the bibliometric analysis from 1943 to 2024 (March 2024), 3 230 publications were found in the Scopus database, the significant growth of which occurred in 2001-2024. The predicted value for 2025-2040 using regression models is 6 504 publications, which is twice their total number in the studied period.

In the process of analysis, the 16 387 keywords identified in the publications were summarized in 7 clusters by the VOSviewer. Among them, such keywords as: Environmental protection dominate; Economic development; Environmental economics and management, regulation, policy; Sustainable development; Pollution (environmental pollution, pollution control), etc. The received keywords were structured according to thematic direction and total link strength. As a result of expert analysis and grouping, 6 aspects were obtained (Economic aspect, Environmental aspect, Aspect of natural resources, Governmental aspect, Industrial aspect, Instrumental aspect), of which the most popular is Environmental aspect (24 329 keywords or 35,22%), which involves the study of enterprise protection technologies, environmental economics, policy, etc.

Keywords: economic protection; enterprise; Scopus; bibliometric analysis; visualization; forecasting.

Introduction

As you know, the issue of economic security, which is related to the formation of mechanisms to protect the enterprise in the conditions of countering threats from the external environment, is under the close attention of many economists. Among them, we note the works of V. M. Geets, M. O. Kyzym, T. S. Klebanova, O. I. Chernyak, Y. A. Zhalilo, B. V. Gubsky, etc. [1-3]. In the conditions of the full-scale invasion of the Russian Federation on the territory of Ukraine and the effect of martial law, not only industrial and civil infrastructure facilities are subject to destruction. Threats to the economic system of the enterprise also become destructive, because the emigration of the Ukrainian population, the destruction of product supply chains, the loss of part of the export potential in the occupied territories and as a result of numerous destructions, etc., can also be counted among the negative consequences of the military aggression of the Russian Federation [4, 5]. This actualizes the study of mechanisms for the protection of the economic system of enterprises and the study of their global trends, which will ensure the realization of interests and the harmonious development of enterprises.
relation between education and economic growth), have given a view on the links between the different authors, the most influential publications, the most active organizations and countries in the field as well. This research was conducted in [10].

Similar results obtained from the VOSviewer functionality and the use of MS Excel data for trend analysis were also obtained in other articles [6, 8-9, 10-12]. At the same time, we note the insufficient level of graphic visualization of research results, which can be eliminated by combining VOSviewer and Sankey diagram.

The purpose of the article

In accordance with the given problem, the article should conduct a study of global trends in the economic protection of the enterprise by performing a bibliometric analysis of the Scopus database, graphic visualization using the VOSviewer and the Sankey diagram, and forecasting based on trend models.

Presentation of the main research material

On the problem of economic protection of the enterprise from 1943 to 2024 (March 2024), 3230 publications were found in the Scopus database. After analysing them, we see a trend towards an increase in their number, starting from 2000, and an increase in research interest in the problem in various countries and scientific institutions (Table 1).

We will use the obtained data (Table 1) to identify dependencies and trends in the study of the problem of economic protection of the enterprise, for this we will use MS Excel (Fig. 1).

Fig. 1. Dynamics of Scopus database publications on the problem of economic protection of the enterprise in 1943-2024 and forecast for 2025-2040

Compiled according to the Scopus database.

As we can see, the dynamic growth of the analysed indicator of publication activity falls on the period 2000-2024.

We will use the dynamics of the number of publications on the problem in 1943-2024 for forecasting for 2025-2040. The obtained forecast shows a trend towards an increase in the number of publications devoted to the study of the problem of economic protection of the enterprise for 2025. The forecast value for 2025-2040 is 6,504 publications, which is twice the total number in the studied period. The forecast has a sufficient level of accuracy.

Using the VOSviewer program, we will perform a qualitative analysis of Scopus database publications and the keywords listed in the materials. A total of 16,387 keywords were identified in the publications during the research period, which were summarized in 7 clusters by the VOSviewer program. The largest cluster (cluster 1) contains 283 keywords, and the smallest (cluster 7) contains 34 keywords. Their detailed characteristics are given in the table 2.

![Fig. 1](image-url)
Table 1. The results of the bibliometric analysis of the publications of the Scopus database on the problem of economic protection of the enterprise in 1943-2024

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of publications</th>
<th>Countries of affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1043-1960</td>
<td>2</td>
<td>US, UK</td>
</tr>
<tr>
<td>1961-1980</td>
<td>20</td>
<td>US, UK, Germany, Canada, Poland, RF, India, China</td>
</tr>
<tr>
<td>1981-2000</td>
<td>230</td>
<td>US, UK, Germany, Canada, Poland, RF, India, China, Italy, Australia, Japan, Spain, Hungary, France, Belgium, Denmark, New Zealand, Pakistan, etc.</td>
</tr>
<tr>
<td>2001-2020</td>
<td>1838</td>
<td>Czech Republic, UK, South Africa, India, China, US, Australia, Singapore, Belgium, Canada, Ukraine, Netherlands, RF, Nigeria, France, Italy, Denmark, UK, US, Slovenia, Sri Lanka, etc.</td>
</tr>
<tr>
<td>2021-2024</td>
<td>1140</td>
<td>China, Ukraine, RF, Tunisia, UK, Hungary, Colombia, Italy, China, Poland, Serbia, Italy, India, Indonesia, Turkey, Ecuador, Brazil, South Korea, Moldova, Netherlands, etc.</td>
</tr>
<tr>
<td>Total</td>
<td>3230</td>
<td></td>
</tr>
</tbody>
</table>

Compiled according to the Scopus database.

Table 2. Analysis of clusters of keywords for the problem of economic protection of the enterprise in the Scopus database

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Items</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>283</td>
<td>accident prevention; accidents; agricultural productions; algorithms; artificial intelligence; automation; automobile industry; behavioural research; behavioural research; big data; ....; taxation; technological innovation; technology innovation; technology transfer; textile industry; textiles; triple bottom line; Ukraine; urban growth</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>221</td>
<td>agglomeration; agricultural land; agricultural production; agricultural robots; agriculture; analytic hierarchy process; analytical hierarchy process; ....; water resources; water supply; water treatment; water use; watersheds; wildlife conservation; wood; angtze river</td>
</tr>
<tr>
<td>Cluster 3</td>
<td>162</td>
<td>abatement cost; air pollutant; air pollution control; air quality; Asian; Asian people; atmospheric pollution; capital; capital investment; carbon dioxide; ....; uncertainty; uncertainty analysis; willingness to pay</td>
</tr>
<tr>
<td>Cluster 4</td>
<td>118</td>
<td>Africa; agricultural development; Americas; article; Asia; behaviour; carrying capacity; ....; united nations; united states; USSR; Vietnam; western Europe; western hemisphere; women; women's rights</td>
</tr>
<tr>
<td>Cluster 5</td>
<td>104</td>
<td>adult; attention; business development; capacity building; catering service; comparative study; competition (economics); conference paper; consumer; consumer behaviour; ....; theoretical study; training; trust; United Kingdom; work environment; workplace</td>
</tr>
<tr>
<td>Cluster 6</td>
<td>78</td>
<td>analysis; awareness; best available technologies; biomass; carbon footprint; chemical analysis; combustion; copper; cost; ....; wages; waste; waste disposal; waste incineration; waste management; waste treatment</td>
</tr>
<tr>
<td>Cluster 7</td>
<td>34</td>
<td>alternative energy; biotechnology; disclosure; eastern hemisphere; economic activity; energy; energy management; energy market; energy resource; ....; supply chain; technology adoption; world</td>
</tr>
</tbody>
</table>

Compiled according to the Scopus database.
Graphical visualization of the received data was carried out with the help of the VOSviewer program, for which a bibliometric network of keywords was formed for the problem of economic protection of the enterprise (Fig. 2, 3).

From the formed bibliographic network, we can trace the dominance of such keywords as: Environmental protection; Economic development; Environmental economics and management, regulation, policy; Sustainable development; Pollution (environmental pollution, pollution control), etc. We will study the change of quality indicators in research on the problem of economic protection of the enterprise in 2005-2022, for which we will use the bibliometric temporal network of keywords on the problem of economic protection of the enterprise (Fig. 3).

Analysing fig. 3, we will highlight the dominance of the following keywords in recent research and publications: China; Innovation; Environmental protection; Government; Economics; Carbon; Decision making.

According to VOSviewer data (Fig. 4), we will structure the obtained keywords according to thematic direction and total link strength. Keywords with the highest total link strength over 1000 were selected for further research. Their grouping was carried out using expert evaluations.

As a result, the following groups of keywords were obtained: Economic aspect (Economic and social effect; Economic development; Economic factors; Sustainable development); Environmental aspect (Environmental economics and management, regulation, policy; Environmental impact; Environmental protection; Environmental technology; Pollution: environmental pollution, pollution control); Aspect of natural resources (Carbon; Emission control; Conservation of natural resources); Governmental aspect (Policy; Public policy); Industrial aspect (Industrial economics; Industrial enterprise; Developing countries); Instrumental aspect (Innovation; Investment; Planning; Commerce; Competition Decision making).
Fig. 3. Bibliometric temporal network of keywords for the problem of economic protection of the enterprise

Compiled VOSviewer.

Fig. 4. VOSviewer analytical function interface

Compiled VOSviewer.
Their statistical analysis and grouping by the level of the target indicator (total link strength) was carried out using the Sankey diagram, which allows you to emphasize the relationships obtained by the VOSviewer and the frequency of their detection in the studied literary sources (Fig. 5).

To form the Sankey diagram, we will use the statistical dependencies detected by the VOSviewer (total link strength>1000), because the condition for using the diagram requires the introduction of at least one quantitative criterion.

So, most often in the scientific literature, the problem of economic protection of the enterprise is considered in the Environmental aspect (24 329 keywords or 35,22%), which involves the study of technologies for the protection of the enterprise, environmental economics, policy, etc. The economic aspect accounts for 19 914 key tracks by topic (28,82%), which are devoted to issues of economic and social effects, harmonious development, etc. Regarding the instrumental aspect of economic protection of the enterprise, as a result of the bibliometric analysis, 9 777 keywords (14,15%) were identified, including innovations, investments, trade, etc.

![Fig. 5. Sankey diagram of groups of keywords for the problem of economic protection of the enterprise and total link strength](image)

**Compiled using online service.**

The aspect of natural resources contains 6 251 keywords (9,05%). The industrial aspect accounts for 3 897 keywords (5,64%), and the Governmental aspect – 4 906 (7,1%).

**Conclusions and prospects for further investigations**

In order to ensure the operation of the system of economic protection of the enterprise in the conditions of military aggression of the Russian Federation, a full-scale invasion of the territory of Ukraine and martial law, the article emphasizes...
the need to study the theoretical foundations of the problem. To achieve these goals, bibliometric analysis of the Scopus database, correlation-regression analysis and forecasting based on a trend model using MS Excel were used. Visualization of the bibliometric analysis was implemented using the VOSviewer program and an online service designed for the construction of the Sankey diagram.

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In further research on the problem, the tools of economic protection of the enterprise should be investigated and recommendations for their use in the conditions of the European integration of Ukraine should be formulated.

СПИСОК ВИКОРИСТАНЬОНИХ ДЖЕРЕЛ

3. Губський Б. В. Підприємства забезпечення економічної безпеки в контексті глобалізації української економіки. Національна програма забезпечення економічної безпеки в контексті стратегії соціально-економічного розвитку України: матеріали круглого столу, 2001, 121 с.


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