

INNOVATIVE AND MILITARY-INDUSTRIAL COMPONENT OF OVERCOMING MODERN CHALLENGES OF THE BALTIC-BLACK SEA REGION COUNTRIES

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Abstract. The purpose of the study is to analyze the capabilities of the military-industrial resources of the Baltic-Black Sea region, the ways of their integration and the level of innovation, as one of the most important components of competitiveness in the global market for weapons and military equipment. Paper contributes to the state-of-the-art of open innovation in way explores of external knowledge used in the innovation process. Study the origin of external knowledge used in the innovation process.

Key words: national economic interests, national security, innovative technological cooperation, correlation analysis, національні економічні інтереси, національна безпека, інноваційне технологічне співробітництво, кореляційний аналіз, krajowe interesy gospodarcze, bezpieczeństwo narodowe, innowacyjna współpraca technologiczna, analiza korelacji.

The world economy is a constant increase in the importance of the impact of innovation. The intensification of scientific and technological progress and trends inherent in the present stage of economic development suggest that the type of innovation will be decisive, and the economy, respectively, becoming more innovative. At the same time, the current global geopolitical situation is characterized by instability and a decrease in the level of security in many regions. This can be attributed to a number of reasons. Reducing the role of the United Nations Organization, focusing on the solving internal problems of United States of America, the impending conflict between the United States and China, the growing ambitions of the Russian Federation, etc.. Central and Eastern Europe is one of those regions in which this tension is felt most acutely. Today it is expressed in a military conflict in the east of our country. The high probability of this conflict was predicted by some politicians and scientists in the field of geopolitics and international relations in the late 90s of the twentieth century, among which the most prominent example is Zbigniew Brzezinski (Brzezinski, Z. (2016)). He also predicted that in the event of Ukraine's reintegration, in one form or another, into Russia, Poland and other Eastern European countries would be at the forefront of the confrontation between Russia and the Western world. In this regard, it is important to understand the speed of development of scientific and technological progress and the scientific tools that allow you to effectively manage and predict the trends of its development. It is important to understand the approaches that allow you to analyze and take into account economic, political and innovative factors of development. In order to effectively use them at the state level to ensure own security function.

The tendency to prioritize national economic interests over regional security interests also contributes to reducing security in Central and Eastern Europe. It is just over ten years since the publication of Chesbrough's (2003) now seminal work introducing the concept of open innovation in innovation management studies. The concept, originally aimed at a managerial audience, has attracted considerable interest among researchers in the field of innovation studies, and policy-makers. For practitioners this was viewed as a means of spanning the boundaries of control in the creation and commercialization of innovation beyond the enterprise (West et al, 2014). For

researchers it signaled the advance of a 'new paradigm', leading to numerous books, journal articles and conferences (for details about the expansion of this body of literature please see Chesbrough and Bogers, 2014). Ultimately this could be viewed as the emergence of a distinct academic community. Acknowledging the developmental potential of the approach, policy makers regionally, nationally and transnational sought to re-align actions towards open innovation. The basic premise of this new approach is opening up the innovation process (Huizing, 2011). One of the most commonly used conceptualizations defines open innovation as 'the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation respectively' (Chesbrough, 2006). For purposes of analytical convenience, rather than an accurate reflection of a preceding empirical reality, it is contrasted with closed innovation, where enterprises internalize the process in its entirety (from idea generation to commercial exploitation). Whilst open innovation may be explored at different levels, research to date has tended to focus on the level of the firm with more recent attention directed at teams and projects (West et al, 2014).

Given the above trends, it is advisable for Central and Eastern European countries to integrate their military, industrial and innovation potentials to enhance the security of the Baltic-Black Sea region and increase their competitiveness in the global race for resources.

Analysis of existing achievements and publications. Note that considering open innovations, it is important to study the dynamics of their development. Comparing them with Chesbrough's (Chesbrough, 2006) closed innovations, he cites an example of industries of closed innovations: nuclear reactors', mainframe computers, aircraft engines. And characterizes them as largely internal ideas, low labor mobility, little VC, few, weak start-ups, universities unimportant. Today's time is characterized by agile changes and fierce competition, when relying on standard solutions is not necessary. Then the principles of open innovation are of particular relevance, (Chesbrough, 2006):

- not all the smart people work for us. We need to work with smart people inside and outside our company;
- external R&D create significant value, internal R&D is needed to claim some portion of that value;
- building a better business model is better than getting to market first;
- if we make the best use of internal and external ideas, we will win;
- we should profit from other's use of our IP, and we should buy others' IP when ever it advances our own business model.

The importance of the institutional context in facilitating access to external (to the firm) knowledge resources, and thus enabling innovation, acquires particular relevance in the case of post-socialist countries. In the late 1980s and early 1990s, they embarked on a process of large-scale discontinuous change: away from long-established institutions governing planned economies towards the introduction of new market ones. This is because it may be relatively easy for the economies in transition to 'copy' the formal institutions of a market economy, but it is much more challenging and time-consuming to get the corresponding informal institutions working as well as effect the change in behavior among stakeholders.

The object of our study is the countries of the Baltic-Black Sea region. A significant number of publications, most of which are journalistic, are devoted to the cooperation of the Baltic-Black Sea region. Nevertheless, there are a significant number of scientific publications in this area, among which there are both articles and monographs, theses (Tkachenko, 2016, Levy, 2007, Chodakiewicz, 2012 and etc.). However, all of them are devoted to the historical, political, social, cultural and other humanitarian aspects of cooperation. In the modern world, the above-mentioned aspects of the development of countries and regions can be realized only if they are based on the basis of a powerful post-industrial economy, competitive science, innovation potential and a high-tech army. Acknowledging the developmental potential of the approach, policy makers regionally, nationally and transnationally sought to re-align actions towards open innovation.

During the analytical review of existing publications, many sources were identified that dealt with the production of weapons and military equipment, the equipping of national armies with them, the issues of import and export (Ukrainian Military Pages, Analysis modernization &

development of Polish Army in 2017 and etc.). However, all of them consider only separately taken economies and use only descriptive statistics without using modern methods of data analysis. Stockholm International Peace Research Institute offers a huge number of analytical reports on security issues in the world, modern military conflicts, equipment of armies, transfer of weapons and military equipment (Martin, Milan, 2016, Wezeman, 2018 and etc.). Most of the reports are global in nature and rely only on descriptive statistics and comparative analysis. Of particular relevance is the information support of emerging processes. Thus, patent information is used at all stages of the life cycle of objects of technology. With their use, the development of technical innovations and their patenting is carried out, the prospects for commercialization of the created industrial property objects and their competitiveness are determined, issues of promotion of new equipment on the market are being addressed.

Basic research materials. Consider the mutual supply of weapons and military equipment between the countries of the Baltic-Black Sea region (Ukraine, Poland, Hungary, the Czech Republic, Slovakia, Belarus, Lithuania, Latvia, Estonia, Romania, Moldova, Bulgaria, Azerbaijan and Georgia) for 2014-2017, compiled by database Stockholm International Peace Research Institute (SIPRI Arms Transfers Database, 2017).

Based on the analysis, we highlight the following trends:

- trade in armaments and military equipment between the countries of the Baltic-Black Sea region is mainly offset by the transfer of used and modernized models;

- Ukraine occupies a dominant position in the arms and military equipment market in the Baltic-Black Sea region, with Ukrainian arms exports to the countries of this region being roughly equal to all the other countries listed above;

- after the outbreak of armed conflict in the east of the country, exports of Ukrainian weapons and military equipment fell sharply, but imports from the Baltic-Black Sea countries grew only slightly and are characterized only by the order of Warmate unmanned aerial vehicles from the Polish company WB Group;

- a regularity, noted long ago by scientists and politicians, about the upcoming military conflict is evidenced by a sharp increase in the country's weapons costs characteristic of the Baltic-Black Sea region, as Georgia sharply increased the import of weapons and military equipment from Ukraine, Poland and Azerbaijan in 2007;

- in 2017, imports of armaments by Azerbaijan increased, which, in the presence of a frozen conflict in Nagorno-Karabakh, is an alarming trend.

Within the framework of this article we will not touch upon the military-political sides of cooperation between the countries of the Baltic-Black Sea region, but concentrate on the innovation-technological and organizational-economic aspects of such cooperation. We will analyze the possibilities of such cooperation on the basis of the defense-industrial and innovation potential of Ukraine and Poland, as the largest exporters of weapons and military equipment among the countries of the region (Wezeman, 2018,). An overview of the products and services of the State Concern "Ukroboronprom" and the Polish Armaments Group, the Polish Armaments Group, an association of arms manufacturers and military Poland, is available on the website of these organizations. Competitive directions of possible cooperation of these enterprises are diverse and deserve separate publications. As part of this work, we will focus on a quantitative assessment of the impact of an increase in the consumption of weapons and military equipment in the domestic markets of Ukraine and Poland on their exports from these countries. We will conduct a quantitative assessment using statistical data sets submitted by the Stockholm International Peace Research Institute (Military expenditure by country as percentage of gross domestic product, 2018).

Table 1 shows the financial indicators of arms exports (\$ million, given by 2016) and military spending as a percentage of GDP for Ukraine and Poland for 2005-2016 (Military expenditure by country as percentage of gross domestic product, 1988-2002, 2018, Government and industry data on the financial value of national arms exports, 2001-2016, 2018).

Table 1 – Arms exports and military expenditures for Ukraine and Poland, 2005-2016.

Year	Ukraine		Poland	
	The financial value of arms exports, in constant (2016) US\$	Military expenditure by country as percentage of gross domestic product	The financial value of arms exports, in constant (2016) US\$	Military expenditure by country as percentage of gross domestic product
2005	731	2,6	443	1,9
2006	731	2,7	411	1,9
2007	810	2,8	455	2,0
2008	892	2,6	601	1,8
2009	895	2,8	2162	1,8
2010	1053	2,7	666	1,8
2011	1071	2,3	1259	1,8
2012	1070	2,4	850	1,8
2013	1030	2,4	1174	1,8
2014	804	3,0	1237	1,9
2015	577	4,0	1425	2,1
2016	770	3,7	1357	2,0

Paired linear correlation coefficient between the financial value of arms exports и military expenditure by country as percentage of gross domestic product for Ukraine is $-0,745$, and for Poland is $-0,007$. Moreover, the correlation coefficient for Ukraine is statistically significant by Student's criterion with a probability of 95%.

So, a linear relationship between the financial value of arms exports и military expenditure by country as percentage of gross domestic product for Ukraine can be described as a strong inverse. This situation can be explained by the fact that after the outbreak of an armed conflict in the east of the country, and, accordingly, an increase in the defense budget, a significant shift in defense products to the domestic market occurred. The relationship between the financial evaluation of arms exports и military expenditure by country as percentage of gross domestic product for Poland missing. This is due to a more stable military-political situation in this country, thanks to participation in the NATO collective security system. The financial value of arms exports и military expenditure by country as percentage of gross domestic product for Ukraine make it reasonable to quantify this linear constraint by the least squares method:

$$\hat{y}_i = 1523,44 - 230,8 \cdot x_i + \varepsilon, \quad (1)$$

where \hat{y}_i – the financial value of arms exports;

x_i – military expenditure by country as percentage of gross domestic product;

ε – random and unaccounted factors in the model;

$\beta_0 = 1523,44$, $\beta_1 = -230,8$ – parameters of regression.

The regression parameters are statistically significant by Student's criterion with a probability of 95%.

The economic meaning of the parameter is the OLS-assessment of the export of Ukrainian weapons and military equipment, if the percentage of GDP spent on defense is zero, i.e. It is estimated in millions of US \$. The economic meaning of the parameter is to reduce the financial

value of arms exports with increasing military expenditure by country as percentage of gross domestic product на 1 %. That is, for every 1% of the Gross Domestic Product invested in supplying its army with armaments and military equipment, the fall in Ukrainian exports of these products is estimated at 230.8 million US \$.

We will bring on fig. 1 correlation field, which is constructed according to the table 1 and is showed the regression line (1) that describes it.

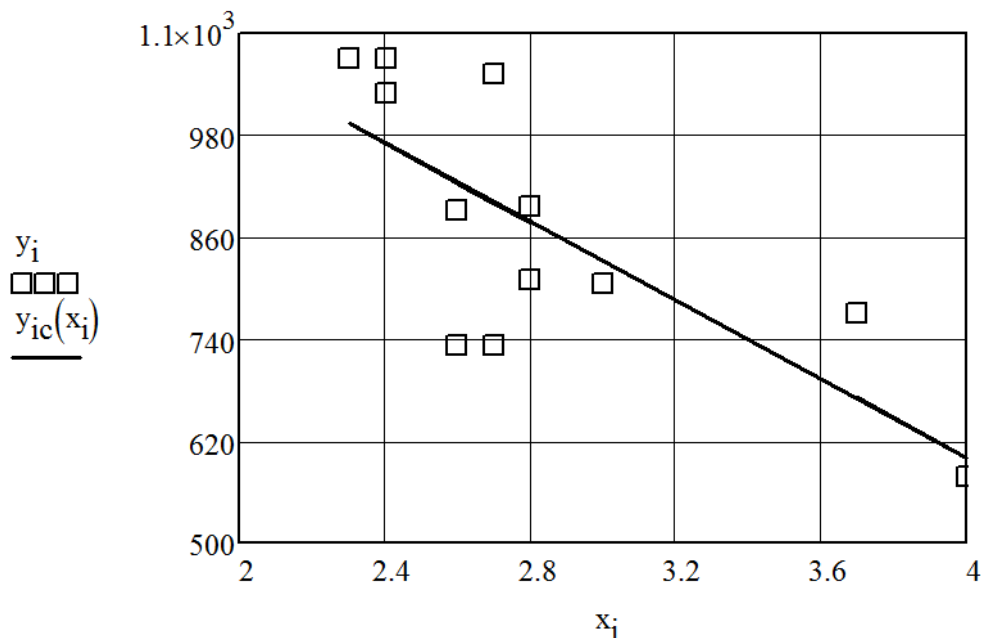


Figure 1 – Dependence of the financial value of arms exports, in constant of Military expenditure by country as percentage of gross domestic product

On Fig. 1 it can be seen how a sharp increase in the percentage of Ukraine’s GDP spent on defense has affected the decrease in exports of weapons and military equipment in recent years (the last two sampling points).

Let us evaluate the quality of the model by the coefficient of determination, which is 0.555 and statistically significant by the Fisher criterion with a probability of 95%. This value of the coefficient of determination indicates that the amount of variance of the dependent variable (the financial value of arms exports), the model explained is 55.5%, while 44.5% is accounted for by random factors unaccounted for in the model.

In addition to the usual assumptions and assumptions used in estimating linear links using the least squares method, we assume that the impact of Ukraine’s GDP decline on financing the rearmament of security forces was offset by financial support from Allies, including through NATO trust funds.

Currently, many politicians and military experts are talking about the need to bring defense costs up to 5% of GDP. According to the model (1), the point estimate of the predicted value the financial value of arms exports will be 269.45 million US\$.

Conclusions and prospects for further research. The empirical research in Ukraine shows that, against expectations coming from the literature, the adversity of the institutional setting does not constrain enterprises, belonging of the four types of innovation outcome, from accessing externally generated knowledge. This is particularly the case regarding innovation implementation, in comparison to the early (idea generation) stages in the process. Innovative enterprises appear to adopt rather diverse strategies regarding the means used to access externally generated knowledge.

As prospects for further research, it is advisable to supplement model (1) with an additional independent variable characterizing the change in GDP over time and the assistance of foreign allies.

Thus, the organizational and economic mechanism of managing a scientific and technical regional program in an innovative economy should be based on a combination of market actions and state regulation aimed at developing and implementing a long-term perspective for the development of science and technology, and increasing the defenses of the Baltic-Black Sea region.

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