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## Article

# Commercialization of intellectual property : innovative impact on global competitiveness of national economies

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**COMMERCIALIZATION OF INTELLECTUAL PROPERTY: INNOVATIVE IMPACT ON GLOBAL COMPETITIVENESS OF NATIONAL ECONOMIES**

**Abstract.** This paper investigates the role of intellectual property in the modern post-industrial economy and its intensive commercialization of the country's competitive advantages in the global economic environment. The main purpose of the research is to prove the hypothesis about the crucial role of intellectual property development in ensuring expanded public reproduction and facilitating the global competitiveness of national economies through innovative modernization of production. To gain the research aim, the authors used a combination of theoretical synthesis and comprehensive statistical analysis. The study follows a deductive approach and theoretical background analysis followed by quantitative research of statistical data. It allowed arriving essential conclusions concerning the role of intellectual property in strengthening the global competitiveness of the national economy and practical policy implications regarding stimulating intellectual property commercialization within the national economy. Paper investigates transmission mechanisms that represent the impact of intensive commercialization of intellectual property on public reproduction and competitiveness of the national economy. Commercialization of intellectual property, defined as a range of activities envisaged for rapid implementation of intellectual activity, resulted in economic turnover to obtain strategic competitive advantages and generate economic profit supported by the transformation of intellectual property into intellectual capital used for the manufacturing of innovative, highly marginal products. Comprehensive statistical data analysis was conducted using quantitative methods (cluster analysis and principal components analysis). The findings proved the key role of intellectual property in the modern system of public reproduction. They demonstrated the multiplicative impact of intellectual property development on a country's competitive global economic environment. Obtained research results provided the basis for policy implications concerning the development of commercialization of intellectual property and stimulation of expanded reproduction of intellectual capital in Ukraine as a precondition of innovative modernization of national industries and acquiring strategic competitive advantages in a globalized market.

**Keywords:** competitive advantages, global economic environment, intellectual property commercialization, intellectual capital, innovative development.

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25

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**Introduction.** The post-industrial transformation of the modern global economic environment turns the human intellectual activity into one of the main accelerators of socio-economic development and an important factor of expanded social reproduction. That provides continuous innovative modernization of production and directly affects the global competitiveness of the national economy.

An efficient intellectual property market provides the basis for the national economy's scientific and technological progress and sustainable development. Moreover, the formation of the intellectual property market precedes the transformation of intellectual capital into a strategic asset of enterprises. Thus, it becomes a key prerequisite for the implementation of an innovative model of economic development. Adopting intellectual activity results in a commercial turnover. Their further effective application in the real sector of the economy guarantees the competitiveness of both individual economic entities in the domestic market and the national economy on a global scale. The diverse experience of various developed countries convincingly demonstrates that commercialization of intellectual property plays a crucial role in ensuring economic turnover of intellectual assets, accumulation of intellectual capital, innovative modernization of social production, and full realization of national scientific and technological potential under the post-industrial transformation of the global economy.

The intensive economic turnover of intellectual property objects facilitates its rapid introduction into production. It turns them into the intellectual capital of economic entities, which is used to manufacture innovative products with a high share of value-added, providing competitive advantages through the unique characteristics of innovative products and generating economic profit with its subsequent reinvestment in further innovation activity. At the same time, the development of intellectual property relations contributes to the expanded reproduction of intellectual capital. It stimulates the commercialization of intellectual property, which forms a reliable basis for technology transfer, cooperation of research centers and universities with businesses to develop new innovative products.

It is important to note that the study of the transmission mechanism and the nature of the innovative impact of intellectual property on the formation of the country's competitive advantages in the global environment is especially relevant for post-socialist countries, including Ukraine, which is characterized by slow diffusion of innovations, increasing structural imbalances and macroeconomic instability, significant lag behind European countries in socio-economic growth, level of technological development and welfare. In this context, the study of the role of intellectual property in innovative development and its impact on social reproduction would substantiate the principles and key objectives of public policy in the field of protection and commercialization of intellectual property to transform them into the intellectual capital of economic entities and promote innovative modernization of Ukraine.

Ukrainian and foreign economic researches widely covered theoretical and applied aspects of the realization of intellectual property relations in the system of social reproduction. At the same time, contemporary studies demonstrate the lack of attention to the quantitative analysis of the nature, features, and transmission mechanism of the innovative impact of intellectual property relations on the competitiveness of the national economy in the modern global economic environment.

The purpose of this paper is to investigate and quantify the innovative impact of intellectual property commercialization on the global competitiveness of the national economy and justify its crucial role in ensuring expanded social reproduction based on innovative modernization of production. To adequately guide the research, the following study objectives were defined: to analyze the theoretical background of research, including existing scientific perspective on nature and peculiarities of intellectual property; to identify objectives and significance of the commercialization of intellectual property in the process of reproduction of intellectual capital; to investigate empirical data concerning the innovative contribution of intellectual property to the economic development of national economies; to assess the innovative impact of intellectual property on the global competitiveness of the national economy; to identify the role of intensive commercialization of intellectual property in ensuring the country's competitive advantage at the

global scale. Achieving these objectives would provide a basis for developing policy implications concerning stimulating commercialization of intellectual property and innovative modernization of the Ukrainian industry.

**Literature Review.** A comprehensive analysis of the role of intellectual property in ensuring the global competitiveness of the economy is impossible without understanding the complex economic and legal nature and specifics of intellectual property, the objects of which combine the characteristics of private and public goods and maximize both public utility and individual utility of its creators.

The term «intellectual property» was first introduced by a judge of the Massachusetts Circuit Court, Ch.L. Woodbury, in 1845 during the proceedings in the patent case of *Davoll v. Brown* (Fisk, 2009). In 1846, this term was first used in Europe by the French lawyer A. Nion in his work «Civil Rights of Authors, Artists, and Inventors» (Prasad and Agarwala, 2009). However, this term had been legitimized only in 1967 with the ratification of the Stockholm Convention establishing the World Intellectual Property Organization. Nevertheless, due to the constant development and complexity of intellectual property relations and the growth of its role in social reproduction, the nature of intellectual property continues to be relevant as a subject of analysis. Consequently, in modern economic research, various theoretical approaches to understanding the nature of intellectual property coexist peacefully.

In his fundamental work devoted to studying economic and legal aspects of intellectual property relations, V. Bazylevych considered intellectual property in the context of the institutional approach as a sanctioned behavioral relationship that emerged during the development of intellectual activity and commercial turnover of intellectual property objects. The researcher believes that intellectual property turned into a specific institution of market economy, which provides identification, protection, and transformation of property rights on innovative technologies into the intellectual capital of enterprises that ensure its competitiveness in the post-industrial marketplace (Bazylevych, 2014).

Director of the Scientific-Research Institute of Intellectual Property, O. Orliuk, defined intellectual property as a key human value representing the vector of development of modern society, contributes to scientific and technological progress, and becomes one of the most important factors of social production and national competitiveness (Orliuk, 2016). However, despite the fundamental importance of intellectual property in stimulating economic, social, and cultural development, the researcher underlined that comprehensive protection of intellectual property rights might have a contradictory effect on the national economy. On the one hand, it facilitates innovative development, and on the other, it could be used by large corporations to strengthen monopoly power and create market barriers (Orliuk, 2016).

Former director of the World Intellectual Property Organization, Kamil Idris, defined intellectual property as a powerful tool for economic growth and the basis of the nation's well-being, which exists in the form of results of intellectual, creative, artistic and scientific activities. In his opinion, intellectual property refers to creative ideas, inventions, technologies, works of art that are intangible by nature but generate real revenue streams in the process of its commercialization providing benefits to all humankind (Idris, 2003).

Many American and European scholars focused their research on the nature and role of the commercialization of intellectual property in promoting national competitiveness and intensifying scientific and technological progress. In particular, Galun and Breiman (1997) considered commercialization as a process of creation and implementation of intellectual property objects in the economic turnover, which generates profit for its creator and, at the same time, turning into core asset of the innovative enterprises that provide competitive advantages on the market resulted from manufacturing of innovative products with unique characteristics and a high share of value-added.

Yang (2013) defined commercialization as the process of attracting intellectual property objects to the sphere of economic activity, which allows the creator of an intellectual product to receive a decent reward and offset the costs of intellectual activity. Besides, it promotes innovation, increases production efficiency,

and stimulates socio-economic growth. On the other hand, McCoy et al. (2010) considered commercialization a complex decision-making process related to implementing appropriate measures for introducing intellectual property objects in production, followed by creating competitive, innovative products and bringing them to be industrial or consumer markets.

Keller (2015) regarded commercialization as a set of measures aimed to protect, value, and manage intellectual property objects that increase its market value and facilitate its introduction in economic turnover, which promotes innovative development, manufacturing of new consumer products, and stimulates socio-economic growth. Furthermore, the researcher emphasizes the important role of intellectual property relations in ensuring the competitiveness of the national economy.

Desforges (2001) emphasized the important role of intellectual property commercialization in implementing intellectual activity results in industrial production or commercial activities on a paid and contractual basis, which provides competitive advantages and predictable revenue streams in the future.

Singh (2015) discovered that companies actively protect their intellectual capital from gaining a competitive advantage and increasing their market share. In turn, this requires an effective government policy aimed at combating the abuse of intellectual property rights to gain market power. Teixeira and Ferreira (2019) demonstrate the contradictory impact of intellectual property rights protection on enterprise competitiveness. In particular, informal protection mechanisms foster the companies' competitiveness, whereas formal protection mechanisms negatively impact that same competitiveness. Based on the estimation of the competitive effect of intellectual property rights, Peneder et al. (2019) proved that better appropriability conditions for exploiting intellectual property at the industry level raise the number of competitors.

Zink (2009) considered intellectual property and the supported innovation as a vital factor, promoting national competitiveness and providing benefits to the companies engaged in innovation, benefits to the national economy, and advantages for collaboration and public research. The researcher underlined tremendous benefits for national and regional economies in industries that rely on intellectual property commercialization and innovative development. Hovenkamp (2019) stresses an ambiguous effect of intellectual property protection on competition and economic development. Intellectual property commercialization fosters technology and innovation development and promotes economic growth by granting many returns to the successful developer. At the same time, active intellectual property rights enforcement limits competition by reducing asset mobility by benefiting select businesses at the expense of consumers. Manderieux (2010) regards intellectual property as an important source of competitiveness that promotes the rapid transformation of knowledge into intellectual assets, which generate new revenue streams, promoting innovation and wealth creation. In her opinion, the economic value of intellectual property is rooted in the legal mechanisms granting exclusive rights to innovative technologies.

Annual Global Competitiveness Report provided comprehensive information on factors of competitiveness organized into 12 pillars, including those relating to intellectual property. Unfortunately, the report does not quantify the impact of these factors on the global competitiveness of countries.

Besides unquestionably positive impact on economic growth, active development of intellectual property could negatively affect the economic development of selected countries. In particular, developed countries can use active policy of intellectual property rights protection for safeguarding their technological leadership and dominant position in the global marketplace. Moreover, through the global intellectual property market, these countries could actively acquire property rights on the new perspective technologies created in developing countries, accelerating cross-border technologies transfer and strengthening their own innovation potential. Independent studies conducted by Posner (1961) and Acquah (2017) demonstrated that active enforcement of intellectual property rights in some cases could widen the technological gap and economic inequality between different groups of countries.

The analysis of theoretical background demonstrated that modern researchers mainly focus on investigating the nature and justification of the important role of intellectual property commercialization in facilitating economic growth and ensuring competitiveness at the micro and macroeconomic level. At the same time, existing studies do not contain a comprehensive statistical analysis of the innovative impact of intensive commercialization of intellectual property on the global competitiveness of the national economy. Besides, they do not provide a comprehensive understanding of the corresponding transmission mechanism. Thus, in the context of globalization of the economic environment, this aspect of the research plays a key role in maximizing the country's economic potential and determines its position in the global income distribution system.

**Methodology and research methods.** Based on the results of extensive literature review and existing theoretical background of research and pre-defined study's purpose and objectives, several alternative hypotheses have been proposed concerning the character of the impact of intellectual property development and the intensity of its commercialization on the global competitiveness of the national economy. Notably, many researchers (s.a. Galun E., McCoy A., Keller G., Bazylevych V., Zink R., Idris, et al.) consider intellectual property as a powerful tool for promoting national competitiveness, intensifying scientific progress, ensuring the innovative development of the economy, and continuous technological modernization through the intensive implementation of the intellectual capital in the production of innovative goods and services. It allows developing the first hypothesis:

H0 – the development of intellectual property and intensive commercialization of its objects have a decisive and innovative impact on the country's global competitiveness.

At the same time, there is a growing concern by some researchers (s.a. Teixeira A., Ferreira C., Orliuk O., Singh S., et al.) that comprehensive protection of intellectual property rights may negatively affect the competitive environment and could be used by transnational enterprises as a tool for strengthening monopoly power and creating market barriers. Therefore, it is hypothesized that:

H1 – the development of intellectual property rights negatively impacts the global competitiveness of the national economy.

At last, intensive commercialization of intellectual property could have an ambiguous effect on the competitiveness of the national economy (s.a. Posner M., Acquah D., Hovenkamp H. et al.). In particular, intellectual property development could strengthen technological leadership and the dominant position of developed countries in the global marketplace and simultaneously constrain the advancement of technological capabilities of developing countries. Thus, based on the arguments mentioned above, the last hypothesis was formed:

H2 – the development of intellectual property has a significantly different impact on the global competitiveness of developed and developing countries.

The analysis of the nature and transmission mechanism of the innovative impact of development and intensive commercialization of intellectual property on the competitiveness of the national economy follows a deductive approach meaning that it starts with a literature review theoretical background followed by quantitative analysis of the role of intellectual property in the formation of global competitiveness of the country to arrive at the conclusions and policy implications. In particular, quantitative analysis of empirical data was preceded by studying the theoretical background of research, which allowed formulating basic hypotheses. For confirming or disproving the hypotheses mentioned above combination of cluster analysis and principal components analysis was applied.

The empirical basis of the research includes statistical data from the World Economic Forum and European Union Intellectual Property Office Industry-level Report 2019. To simplify cluster analysis, sample data from a cross-section of 100 countries holding the top 100 places in the Global Competitiveness Ranking were used. The sample data for principal components analysis include 12 indicators used in the calculation of the Global Competitiveness Index, including the level of intellectual

property protection, growth of innovative companies, state of cluster development, international co-invention and multi-stakeholder collaboration, number of patent applications per million population, etc. (Table 1).

The research design involves the following stages of a comprehensive analysis of the innovative impact of intellectual property on the global competitiveness of the national economy:

1) reducing the dimension of data and combining key indicators of intellectual property commercialization into groups depending on their impact on global competitiveness.

2) division of the countries included in the sample into groups depending on the level of intellectual property development, the availability of institutional and economic preconditions for intensive commercialization of its objects, as well as the level of competitiveness.

3) establishing the relationship between the level of intellectual property development and commercialization and indicators of global competitiveness of the national economy by comparing the results of cluster analysis and principal component analysis.

4) research of the transmission mechanism of impact of intensive commercialization of intellectual property on the expanded social reproduction and formation of the country's competitive advantages globally using scientific abstraction and system analysis.

5) development of the implications concerning effective public policy aimed at stimulating the commercialization of intellectual property to increase the competitiveness of the national economy and innovative modernization of industrial production of Ukraine.

**Table 1. Selected indicators used in principal components analysis**

<b>№</b>	<b>Indicator title</b>	<b>Indicator number</b>	<b>Indicator description</b>
1.	IPP	1.15	Intellectual property protection
2.	IC	1.13	Incidence of corruption
3.	DET	7.01	Distortive effect of taxes and subsidies on competition
4.	DCP	9.01	Domestic credit to private sector
5.	VCA	9.03	Venture capital availability
6.	MCS	9.04	Market capitalization share
7.	GIC	11.07	Growth of innovative companies
8.	SCD	12.02	State of cluster development
9.	ICIMC	12.03-12.04	International co-inventions and multi-stakeholder collaboration
10.	NPA	12.06	Number of patent applications per million population
11.	RDE	12.07	Research and development expenditures
12.	RSIP	12.08	Research institutions prominence

Sources: developed by the authors based on (WEF, 2019).

Principal components analysis is one of the most effective tools for reducing the number of variables and determining relationships between them. The advantages of this method are maximum informativeness, minimal deformations of the data structure, and the possibility of its application to both normally and asymmetrically distributed data series. Choice of this method stemmed from a significant number of indicators that directly or indirectly reflect the level of intellectual property development and intensity of its commercialization in the structure of the Global Competitiveness Index, elaborated by experts of the World Economic Forum. Application of the principal components analysis allows retrieving complete information on intellectual property development in different countries worldwide using a minimum number of variables. Main components analysis would provide a grouping of indicators according to their relationship, particularly the dispersion. Besides, it would develop two new variables (principal components) which consolidate the impact of two different groups of factors. New variables are formed by

statistical weighing of indicators within one group. In this case, these variables would not correlate with each other, have a maximum sample dispersion and the sum of the squares of the weights of each component, and be equal to one (Jolliffe, 2002).

The selection of the principal components is carried out sequentially and in such a way that the sample dispersion of the corresponding component at each iteration will be maximum, and the correlation between the components be zero. Therefore, this method allows to visualize the relationship between different groups of data indicators in the sample and maximize the relationship between different indicators of development and intensity of commercialization of intellectual property in the structure of the global competitiveness index. Cluster analysis plays an important role in confirming the hypothesis of the important role of intellectual property development in ensuring the country's competitiveness in the global economic environment. This method aims to sequentially divide multidimensional data sampling into groups (clusters) according to the selected similarity criteria (Everitt et al., 2011). In addition, clustering allows visualizing the relationships between different groups of indicators.

Cluster analysis would be based on a hierarchical bottom-up algorithm with full connection, which provides a tree-like hierarchical classification of countries into clusters depending on the level of development of intellectual property commercialization and its innovative impact on the country's global competitiveness. Hierarchical clustering algorithm will involve selecting two large groups in a sample and sequentially dividing them into smaller clusters based on the distances between them determined by the principle of complete connection.

The cluster analysis results would describe the differences between various groups of countries in developing intellectual property commercialization and its impact on the competitive advantages of the countries in the global economic environment. In addition, the results of the comparison, systematic, and clustering analyses for the basis for justifying the transmission mechanism of the impact of commercialization of intellectual property on expanded social reproduction and the formation of global competitiveness of the national economy.

Statsoft Statistica 13.1 and MS Excel 2019 were used during the principal components' evaluation and clustering. Comprehensive application of both general theoretical and special quantitative methods of statistical analysis would allow confirming or disproving hypotheses concerning the innovative impact of intellectual property development on the global competitiveness of the national economy.

**Results.** The specified indicators were divided into two groups (principal components) based on the statistical analysis of the Global Competitiveness Report data in the context of twelve indicators of intellectual property development using the principal components method. The first principal component included 7 indicators that characterize the subsystem of organizational and economic support of the commercialization of intellectual property, as well as the effectiveness of transmission mechanism, which facilitates the transformation of intellectual property into the intellectual capital of innovative enterprises, including the effectiveness of protection and enforcement of intellectual property rights; incidence of corruption; country's participation in international co-invention and multi-stakeholder collaboration; state of cluster development; research institutions prominence; research and development expenditures; the number of patent applications per million population. It stands to note that performed analysis has shown a decisive influence of this component on developing the country's global competitiveness and rate of expanded reproduction. High values of these indicators are demonstrated by countries characterized by the intensive introduction of innovations and intellectual capital into industrial production, such as the USA, China, Germany, and others. The second principal component includes 5 indicators that directly characterize the level of development and overall efficiency of financial and economic mechanisms of intellectual property commercialization, including the distortive effect of taxes and subsidies on competition; the volume of domestic credit to the private sector; venture capital availability; development of equity capital markets; activity of innovative enterprises. High values of these indicators are observed



in countries with developed markets for financial services and securities and effective state support for innovative enterprises, such as Japan, Israel, France, and others. The conducted principal component analysis demonstrates the adequacy of the sampling and validity of the results. Analysis of scatterplot matrix proved a linear relationship between variables. Application of Kaiser-Meyer-Olkin Test showed middling sampling adequacy – KMO value has almost reached 0,8 and was 0,78. The rotation matrix shows the adequate correlation between indicators and components (Table 2).

**Table 2. Rotated component matrix (Rotation Method: Quartimax with Kaiser Normalization)**

Indicator	Component 1	Component 2	Indicator	Component 1	Component 2
IPP	0,822	0,310	GIC	0,455	0,716
IC	0,757	0,326	SCD	0,948	0,032
DET	0,063	0,851	ICIMC	0,849	0,319
DCP	0,452	0,759	NPA	0,851	0,362
VCA	0,438	0,741	RDE	0,708	0,385
MCS	0,549	0,780	RSIP	0,880	-0,086
<b>% of Variance</b>	<b>0,490</b>	<b>0,281</b>	<b>Total Variance</b>	<b>5,879</b>	<b>3,368</b>
<i>Total variance explained in rotated components: Rotation Sums of Squared Loadings</i>					
<b>% of Variance</b>	63,987	13,077	Total	7,678	1,569
<b>Cumulative %</b>	63,987	77,064			

Sources: developed by the authors using Statistica 13.1 software.

The results of principal components analysis showed that level of intellectual property development and the impact of intensive commercialization of intellectual capital on the global competitiveness of the national economy by 13% is determined by the second component and by 64% due to the influence of the first component. In general, application of the principal components analysis in evaluation of the impact of intellectual property commercialization on the global competitiveness of the country allowed to divide all countries into four groups, depending on the combination and vector of influence of the above-mentioned main components on country's competitiveness in the global economic environment.

The first group includes countries characterized by a high level of organizational and institutional support for intellectual property development, effective transmission mechanisms that establish relationships between research institutions and innovative enterprises, and developed financial and economic mechanisms of intellectual property commercialization, such as Australia, Austria, Great Britain, Denmark, Israel, Canada, Netherlands, Norway, France, Switzerland, Sweden, Japan, and others.

The second group includes countries that focused on establishing effective institutional and organizational support of intellectual property development and efficient transmission systems that provide the rapid implementation of intellectual capital in production, such as Germany, USA, Bahrain, Hong Kong, India, China, Luxembourg, Malaysia, Malta, New Zealand, United Arab Emirates, and others.

The third group comprises states that rely mainly on existing within the national economy financial and economic mechanisms of intellectual property commercialization, including credit to the private sector, venture capital availability, innovative clusters development, state support for technology transfer, namely: Brazil, Greece, Italy, Cyprus, Mexico, Poland, Russia, Slovenia, Hungary, Ukraine, Uruguay, and others.

The fourth group includes countries that combine a low level of organizational and institutional support for the enforcement of intellectual property rights with underperforming transmission system, which fails to facilitate the transformation of intellectual activity results into the intellectual capital of innovative enterprises, including Algeria, Bangladesh, Bulgaria, Vietnam, Armenia, Guatemala, Honduras, Egypt, Cambodia, Morocco, Namibia, Nepal, Peru, Philippines, Tajikistan, and others. In addition, most of these countries are characterized by a low level of innovative development and slow socio-economic growth.

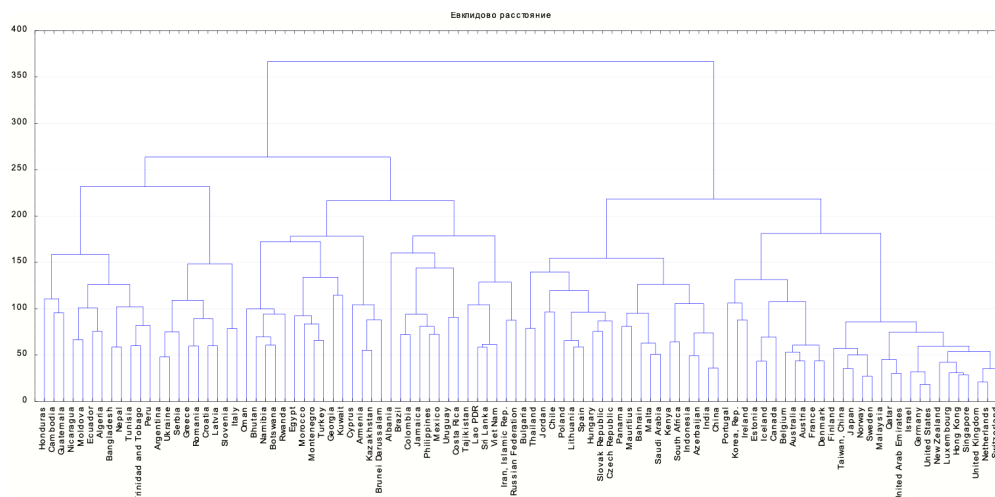
Identification of the principal components, which reflects the consolidated impact of the two main groups of indicators of intellectual property development on the global competitiveness of the national economy, provides the basis for subsequent cluster analysis of countries that holds top 100 places in the Global Competitiveness Ranking of the World Economic Forum in 2019. Cluster analysis of the sample data from a cross-section of 100 countries using Statistica 13.1 software provides a hierarchical classification of countries into groups depending on the intellectual property development and value of each principal component identified at the previous research stage. Each of these groups is characterized by a different ratio of the two principal components of intellectual property development – performance of the organizational and economic support of the commercialization of intellectual property, as well as the effectiveness of corresponding transmission mechanism; development and overall efficiency of financial and economic mechanisms of intellectual property commercialization (Figure 1).

Since sample data was standardized, the Euclidean squared distance was used as a measure for clustering. Application of Silhouette analysis showed the value of the coefficient of 0,81. Thus, that proved consistency within clusters of data and validity of the results of conducted cluster analysis.

The first group includes countries with a developed intellectual property market and effective system of protection and enforcement of intellectual property rights that promote commercialization of innovative technologies and products, as well as the development of intellectual capital on enterprises, including (position in the Global Competitiveness ranking indicated in parentheses): USA (2), United Kingdom (9), Japan (6), Germany (7), Taiwan (12), Sweden (8), France (15), Canada (14) and others. The analysis of the global competitiveness index showed that the vast majority of these countries belong to the leaders of Global Competitiveness Ranking and demonstrate high rates of innovative development and economic growth. The second group comprises states that actively participate in international scientific and technical cooperation, promote the development of scientific research institutions and industrial innovation clusters, characterized by a substantial volume of research and development expenditures, and, at the same time, have some problems in the field of protection of intellectual property rights. These countries are Bahrain (45), Bulgaria (49), Lithuania (39), Slovak Republic (42), China (28), Indonesia (50), Hungary (47), Poland (37), Thailand (40), and others. The analysis demonstrates that the vast majority of these countries are in the middle of the ranking and had relatively high GDP per capita, which allows them to develop a domestic market for innovative products and maintain a stable and high demand for innovative goods and services. The third group includes countries that adhere to minimum standards for the protection and enforcement of intellectual property rights and, simultaneously, provide a fairly high level of development of the scientific institutions and research universities, a satisfactory level of research and development expenditures, the existence of industrial innovation clusters, and also a moderate number of patent applications per million population and underperforming innovative enterprises, in particular: Russia (43), Kuwait (46), Mexico (48), Oman (53), Uruguay (54), Kazakhstan (55), Colombia (57), Brunei Darussalam (56), Turkey (61), Costa Rica (62) and others. The analysis results showed that a significant part of these countries is in the third quarter of our sample based on the Global Competitiveness ranking.

The results of the cluster analysis demonstrate that Ukraine (85), together with Argentina (83), Trinidad and Tobago (79), Algeria (89), Moldova (86), Tunisia (87), Ecuador (90), Guatemala (98), Honduras (100) and some other countries belong to the fourth group of countries characterized by a relatively low level of intellectual property development; underperforming organizational and institutional support for the protection and enforcement of intellectual property rights; ineffective financial and economic mechanisms of intellectual property commercialization. Besides, the mentioned above has a highly negative impact on Ukraine's place in the global competitiveness ranking and, at the same time, demonstrates an extremely slow diffusion of innovation and insufficient competitive advantages of the country in the global economic environment. Therefore, cluster analysis and the hierarchical classification of countries into groups depending on the intellectual property development and value of each principal component confirm

hypothesis H0. Thus, the level of intellectual property development is strongly associated with the national economy's global competitiveness. While results of conducted research support hypothesis H0, hypothesis H1 was rejected given that cluster analysis did not reveal any country that would combine a high level of global competitiveness and sustained strong economic growth with the underdeveloped mechanism of intellectual property commercialization and underperforming system of institutional support for intellectual property rights protection and enforcement.



**Figure 1. Results of cluster analysis based on principal components of intellectual property commercialization**

Sources: developed by the authors using Statistica 13.1 software.

Hypothesis H2 concerning the ambiguous effect of intellectual property development on global competitiveness was also disproved since developed and developing countries have been almost equally distributed among the last three groups. In particular, developing countries (such as Poland, Romania, Turkey, Hungary, Bulgaria) demonstrate relatively good indicators of economic growth, global competitiveness, and innovative development. Besides, they are simultaneously characterized by established mechanisms of institutional and organizational support of intellectual property commercialization.

It stands to emphasize that this conclusion is fully consistent with statistics of the European Union Intellectual Property Office on the contribution of intellectual property to the economy of member states. According to a special industry-level report of EUIPO published in 2019, industries based on the intensive exploitation of intellectual property annually generate about 40% of the GDP of the EU (Table 3). Analysis of these statistics confirms the crucial role of intellectual property in ensuring expanded social reproduction. Moreover, it shows the gradual transformation of intellectual capital into one of the main drivers of economic growth of European countries that build their economies on intensive commercialization of intellectual property.

Special industry-level report 2019 issued by the EU Intellectual Property Office includes data concerning 353 IP-intensive industries out of a total of 615 industries defined in the NACE classification used by Eurostat. Therefore, the share of industries directly connected with active exploitation and commercialization of intellectual property represents more than 57% of their total number. At the same

time, noted industries annually generate EUR 6,5 trillion value-added or 44,8% of the GDP of the EU, providing more than 62,9 million jobs, which is more than a quarter of total employment (Table 3).

**Table 3. Contribution of intellectual property intensive industries to European economy according to EUIPO Industry-level Report 2019**

No	Country	Value-added (€ million)	Share of GDP (%)	Employment	Share of employment (%)
1.	Austria	149898	43,6%	1208456	29,6%
2.	Belgium	160756	39,1%	1178785	26,1%
3.	Bulgaria	23287	51,3%	952196	32,3%
4.	Czech Republic	85882	51,4%	1846039	37,3%
5.	Denmark	122770	45,2%	859932	32,0%
6.	Finland	94731	45,0%	664145	27,9%
7.	France	940008	42,9%	6400813	24,5%
8.	Germany	1521603	49,9%	13138181	33,3%
9.	Greece	63254	35,9%	964327	27,2%
10.	Hungary	53052	48,2%	1288546	30,8%
11.	Ireland	158317	65,0%	542246	27,1%
12.	Italy	774345	46,9%	6938887	31,5%
13.	Lithuania	16157	43,0%	398069	30,6%
14.	Luxembourg	24439	47,3%	103139	40,9%
15.	Netherlands	271187	39,3%	2336422	28,8%
16.	Poland	177229	42,0%	4183406	26,5%
17.	Portugal	76271	42,5%	1259100	29,2%
18.	Romania	74731	46,5%	1930445	23,5%
19.	Slovakia	34866	44,3%	751766	31,2%
20.	Spain	432642	40,1%	4785962	27,0%
21.	Sweden	192419	42,9%	1496102	32,1%
22.	United Kingdom	1037692	42,6%	8429503	28,1%
	<b>European Union</b>	<b>6551768</b>	<b>44,8</b>	<b>62962766</b>	<b>29,2</b>

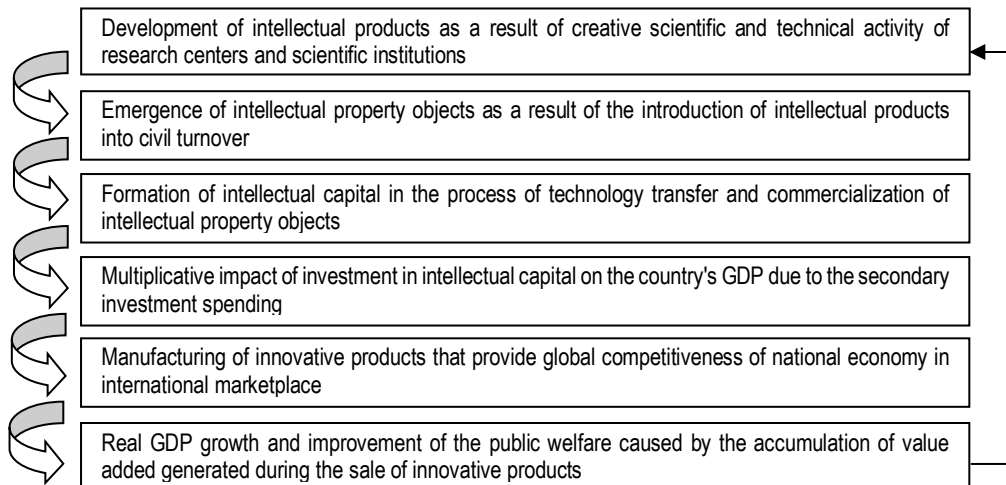
Sources: developed by the authors based on (EUIPO, 2019).

Among all EU members, Germany becomes a leader in the contribution of IP-intensive industries to the GDP (EUR 1,52 trillion or 49.9% of GDP). Particularly high shares of value-added generated in IP-intensive industries are also found in Great Britain – EUR 1,04 trillion or 42,6% of GDP; France – EUR 0,94 trillion or 42,9% of GDP; Italy – EUR 0,77 trillion or 46,9% of the GDP. The lowest contribution of IP-intensive industries to GDP found in Lithuania – EUR 16,1 billion or 43.0% of GDP (Table 3).

The results of profound and systematic analysis of principal components analysis and clustering, along with the wide application of methods of deduction and scientific abstraction, provides the basis for uncovering and investigating transmission mechanism of the innovative impact of intellectual property commercialization on the global competitiveness of the national economy in the modern economic environment (Figure 2). It could be assumed that the stimulating innovative impact of intellectual property commercialization on the global competitiveness of the country is achieved through the stable, recurring causal relationship between the commercialization of creative ideas and innovative technologies, and intensive implementation of the intellectual capital in production and commercial activities to produce innovative products. It ensures the formation of the country's competitive advantages in the global marketplace related to the high share of value-added and unique characteristics of innovative products.

Development of intellectual property objects followed by technology transfer and commercialization of innovative technology or product. After assignment or licensing of intellectual property objects, innovative enterprises provide its introduction in social production and turn them into intellectual capital, which is used

to manufacture innovative products with a high share of value-added, gaining competitive advantages, increasing market share and value extraction through the sale of an innovative product to the customer.



**Figure 2. The transmission mechanism of the innovative impact of intellectual property commercialization on the global competitiveness of the national economy**

Sources: developed by the authors.

Furthermore, the transmission mechanism promotes the development of scientific, technical, and innovative activities, significantly expanding the opportunities of creators of intellectual products in the realization of their intellectual property rights, sale of their own creative work. Besides, it redistributes the value-added generated by the successful commercialization of intellectual property in industrial production.

Companies that participate in intellectual property commercialization focused on innovative modernization of production, enabling them to exploit new technologies as a means of cost reduction and improve product quality. Consumers also benefit from intensive intellectual property commercialization since it enables them to meet their own economic needs at a new quality level through consumption of innovative products, which increases consumer spending, stimulates GDP growth, and ultimately promotes the global competitiveness of the national economy.

**Conclusions.** Comprehensive analysis of statistics confirmed the hypothesis concerning the decisive role of intellectual property development and intensive commercialization of its objects in promoting innovative modernization of production and ensuring the competitiveness of the national economy in the global economic environment. At the same time, conducted research and evaluation of the principal components of intellectual property development in the structure of factors of global competitiveness of the Ukrainian economy showed low efficiency of the domestic system of intellectual property rights protection. Moreover, there is an underperforming transmission mechanism, which fails to facilitate the transformation of intellectual activity results into the intellectual capital of innovative enterprises. In this context, the formation of the competitiveness of the Ukrainian economy in the global economic environment directly depends on the rapid transition to innovative modernization of production on the principles of intensive intellectual property commercialization. The peculiarities of the domestic economy analysis indicated that state support and selective public funding of intellectual property commercialization

should be considered the key preconditions for comprehensive, innovative modernization of the domestic economy and the realization of competitive advantages of national enterprises in the global marketplace.

Data obtained during the principal component analysis allowed arriving to following policy implications concerning the promotion of intellectual property development and stimulating commercialization of intellectual capital:

- development of the legal framework for intellectual property commercialization to avoid juridical conflicts and provide harmonization of the Ukrainian legislation with the EU law;
- establishment of an effective two-tier national system of intellectual property protection;
- implementation of fiscal preferences for companies that actively investing in intellectual capital and engaged in the commercialization of intellectual property;
- enhancing the effectiveness of the sanctioning system through increased penalties for intellectual property rights infringements;
- improvement of mechanisms of civil and criminal protection of intellectual property; promotion of the development of intellectual property insurance and implementation of best practices in risk-management of intellectual property commercialization;
- establishment of an institutional framework for the development of venture funding and bank lending of small and medium-sized innovative enterprises;
- development of the stock market for securitization of intellectual assets; enhancing the effectiveness of technology transfer through development of spin-off companies and industrial innovation clusters on the principles of public-private partnership.

Implementing these public policy measures would create a reliable basis for intensifying the commercialization of intellectual property, promoting investment in intellectual capital. Besides, in the long-run perspective, it would ensure the global competitiveness of Ukraine.

This research study has some limitations that could help identify directions for future research addressing existing limitations. First of all, the sample data for 100 countries based on the Global Competitiveness Report released in 2019. The vast majority of countries included in the sample refer to high-income, upper-middle, and lower-middle-income groups. Further, the dynamics of the relevant indicators of global competitiveness were studied. In turn, the sample was expanded to include low-income countries. In addition, the results of the cluster and principal components analysis could be inherently complemented with regression analysis of the impact of principal indicators of intellectual property development and intensity of commercialization of intellectual capital on economic growth national competitiveness across the sample of 100 countries divided into four clusters. Implementation of these perspectives would provide a deeper understanding of the transmission mechanism of the innovative impact of intellectual property commercialization on global competitiveness.

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**Комерціалізація об'єктів інтелектуальної власності: інноваційний вплив на глобальну конкурентоспроможність національних економік**

Стаття присвячена дослідженню ролі інтелектуальної власності в сучасній постіндустріальній економіці. У роботі проаналізовано інноваційний вплив інтенсивної комерціалізації постіндустріальної економіки на конкурентні переваги країни в глобальному економічному середовищі. Метою дослідження є перевірка гіпотези про вирішальну роль розвитку інтелектуальної власності у забезпеченні розширеного суспільного відтворення та формування глобальної конкурентоспроможності національної економіки у процесі інноваційної модернізації виробництва. Для досягнення поставленої мети, у ході дослідження застосовано теоретичні методи та прикладний інструментарій статистичного аналізу. В основу дослідження покладено дедуктивний підхід, що передбачає поступове сходження від загального до конкретного. Зокрема, кількісному аналізу емпіричних даних передують вивчення теоретичних засад дослідження та ознайомлення із сучасною базою даних з досліджуваної проблематики. Таким чином, це дозволило дійти важливих висновків щодо інноваційної ролі інтелектуальної власності у формуванні глобальної конкурентоспроможності національної економіки та заходів державної політики щодо захисту прав творців інтелектуального продукту та стимулювання комерціалізації інтелектуальної власності в рамках національної економіки. У рамках даної роботи, проаналізовано трансмісійний механізм, що сполучає систему цивільного обороту результатів інтелектуальної діяльності та сферу суспільного виробництва і, у такий спосіб, створює передумови для залучення до господарського обороту об'єктів інтелектуальної власності з наступною трансформацією у інтелектуальний капітал підприємств реального сектору економіки. Доведено, що інтенсивна комерціалізація інтелектуальної власності має інноваційний вплив на конкурентоспроможність національної економіки та стимулює розширене суспільне відтворення. Комплексний аналіз статистичних даних за допомогою комбінації кількісних методів (кластерний аналіз та аналіз основних компонентів) підтвердив гіпотезу про визначальну роль інтелектуальної власності в сучасній системі суспільного відтворення. До того, результати аналізу продемонстрували мультиплікативний

інноваційний вплив розвитку інтелектуальної власності на конкурентоспроможність країни в глобальному економічному середовищі. Аналіз головних компонент засвідчив, що чинна система інституційного та організаційно-економічного забезпечення господарського обороту результатів інтелектуальної діяльності в Україні не дозволяє сформувати стійкі конкурентні переваги національної економіки на засадах інноваційної модернізації суспільного виробництва. Отримані результати дослідження дозволили визначити пріоритетні напрями державної політики щодо стимулювання комерціалізації об'єктів інтелектуальної власності, а саме: внесення змін до спеціального законодавства в цілях його гармонізації з нормами права ЄС у сфері захисту інтелектуальної власності; запровадження фіскальних преференцій пільгового характеру для суб'єктів господарювання, які здійснюють комерціалізацію об'єктів інтелектуальної власності; створення умов для розвитку венчурного фінансування та банківського кредитування суб'єктів інноваційної діяльності, що забезпечуватиме інноваційний вектор розвитку виробництва та глобальну конкурентоспроможність національної економіки.

**Ключові слова:** конкурентні переваги, глобальне економічне середовище, комерціалізація інтелектуальної власності, інтелектуальний капітал, інноваційний розвиток.