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Trends in Scientific Cooperation between Ukraine and the European Union: A Bibliometric Analysis (1995–2010)*

Present study attempts to assess the dynamics of the publication activity of Ukrainian scientists from 1995 to 2010 and to analyze how the journal articles published by collaborating European and Ukrainian researchers, are distributed among EU member states. The main sources of the input data were the Elsevier's Scirus and Scopus web-resources. Additionally, data on Thomson Reuters's Web of Science (WoS) was used from the reports by the National Science Foundation (USA). The number of journal articles that are distributed among various data sources indicate several different results in absolute values and in nature of the trends. Evaluation of WoS data shows a decrease in publication activity of Ukrainian scientists. At the same time, the results of bibliometric measurements in Scirus and Scopus reveal an initial increase and then, from 2001, a stabilization in the number of Ukrainian publications. The revealed tendency of saturation of publication productivity of Ukrainian researchers is undoubtedly the consequence of several factors, both internal and external in nature. The possibility of evolution of Ukrainian science in the direction of «saturation» in connection with Dr. Derek J. de Solla Price's hypothesis is discussed. The rank distribution of joint scientific publications of Ukrainian and European researchers among the EU countries revealed a top-group of six-countries that have the most productive scientific cooperation with Ukraine. The rank series of both Scirus and Scopus correlated well with each other and can be used for bibliometric monitoring of international scientific cooperation. In terms of methodology, the importance of creating the complete thematic bibliographies of scientific publications as an information platform of scientometrics is emphasized.

The development of international cooperation in spheres of science and technology (S&T) is an important aspect of Ukrainian public policy. Special consideration is given to the scientific cooperation with the European Union. Scientific cooperation of the EU countries one another and with other developed regions, with Economies in Transition and with Developing Countries have been analysed by W. Glдnzel et al. for 1985-1995 [1]. The status, trends and prospects of such collaboration have recently been summarized in the White Paper on Opportunities and Challenges in View of Enhancing the EU Cooperation with Eastern Europe, Central Asia, and Caucasus in Science, Research, and Innovation [2]. Present study attempts to assess the dynamics of the publication activity of Ukrainian scientists from 1995 to 2010 and to analyze how the journal articles published by collaborating European and Ukrainian researchers, are distributed among EU member states.

The main sources of input data were a comprehensive science-specific search en-

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gine, Scirus [3], and an abstract and citation database, Scopus [4] (Elsevier B.V., Amsterdam, the Netherlands). A search query was defined as a country's name, in English, within «Affiliation country» (Scopus) or «Author affiliations» (Scirus), and limited to journal articles. Data on Web of Science (WoS, Thomson Reuters, Manhattan, New York, USA) was obtained from the reports by the National Science Foundation (Arlington, USA) [5] and The World Bank (Washington D.C., USA) [6].

Dynamics of publications. The number of journal articles that are distributed among various data sources indicate several different results in absolute values and in nature of the trends (Fig. 1). The absolute values of the number of publications reflect, in a certain way, the properties of the databases used. However, the analysis of the dynamics of their change reveals the opposite trend. Evaluation of WoS data shows a decrease in publication activity of Ukrainian scientists. At the same time, the results of bibliometric measurements in Scirus and Scopus reveal an initial increase and then, from 2001, a stabilization in the number of publications by Ukrainian researchers. Additionally, there is a considerable correlation between the dynamics of publications in foreign journals and the number of foreign funded grants obtained by Ukrainian scientists, as well as the number of scientists on contract in foreign research centers (data not shown).

Joint publications. Utilizing measurements from Scirus and Scopus, the EU countries were ranked according to the

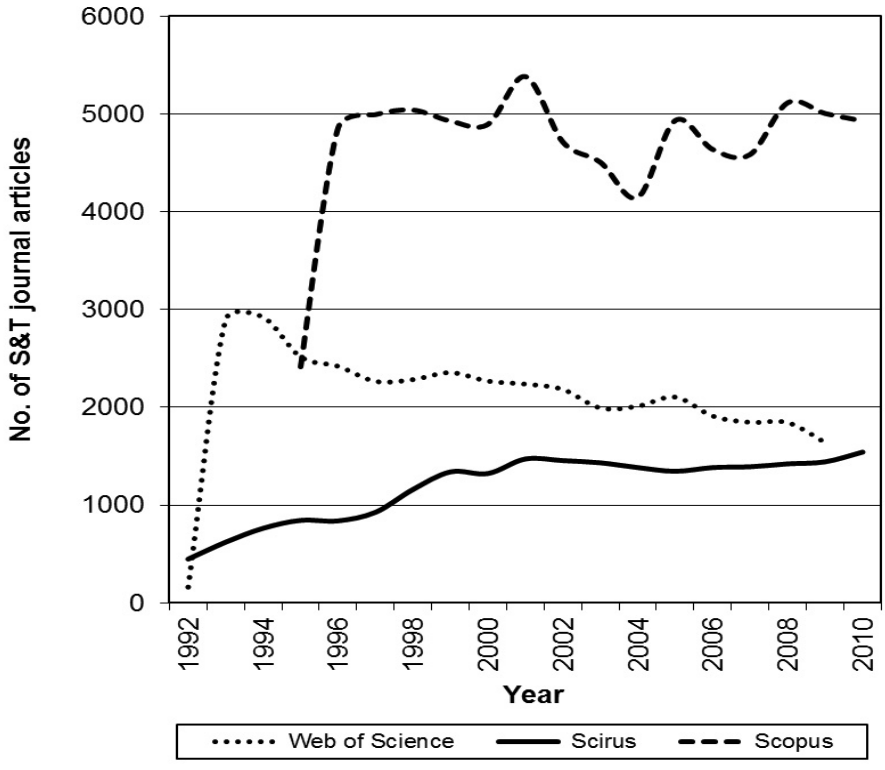

Figure 1: Dynamics of publication activity of Ukrainian scientists: a comparative analysis of databases

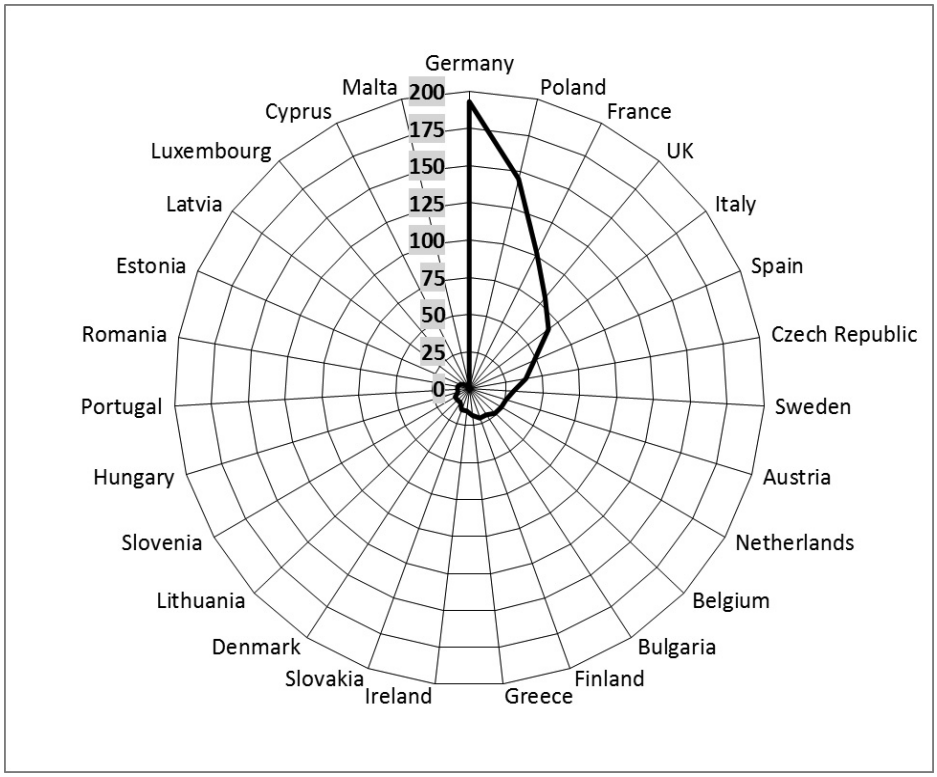

Figure 2: EU country distribution of Ukrainian and EU joint publications (1995–2010)

number of joint publications with their Ukrainian collaborators. Distinguishable is the top-group comprising of six countries that have the most productive scientific cooperation with Ukraine, in the context of the joint publication activity (Fig. 2).

Bibliometric indicators obtained from estimates in Scirus and Scopus, oppose each other both in their absolute and relative values. When the number of joint publications among the total number of Ukrainian publications was evaluated within the Scopus database, it was estimated 60-80 % greater in comparison to those indexed in Scirus (Table 1). However, the absolute number of records according to the search in Scopus was 2 to 3 times higher than those in Scirus. Despite this, the rank series of both systems correlated well with each other and can be used for bibliometric monitoring of international scientific cooperation.

The revealed tendency of stabilization of publication productivity of Ukrainian researchers is undoubtedly the consequence of several factors, both internal and external in nature. Does this mean that Ukrainian science evolves in the direction of «saturation», and the hypothesis put forward half a century ago by Derek J. de Solla Price [7] may indeed be true in the context of globalization and informatization of society [8]? Especially, since to a varying degree, a similar trend is observed when evaluating the dynamics of the publication activity of scientists in Russia, Bulgaria, Slovakia, Finland and France (data not shown).

Table 1

EU country distribution of Ukrainian and EU joint publications as percent of total number of Ukrainian publications (1995–2010)

Country (top 6)	Percentage of joint publications, %	
	Scirus	Scopus
Germany	9,97	7,21
Poland	7,76	4,60
France	5,15	3,34
United Kingdom	3,53	2,81
Italy	2,91	2,00
Spain	1,77	1,39
∑	31,08	21,35
Total percent of Ukrainian and EU joint publications	44,01	30,34

In terms of methodology, it is important to emphasize that the relevance of scientometric research, in particular the level and trends of development of national science and international scientific cooperation, will always be limited to the properties of the database that was used to evaluate them. Therefore, the task of creating the *complete* thematic bibliographies of scientific publications as an information platform of Scientometrics, in our opinion, is vital.

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ТЕНДЕНЦИИ НАУЧНОГО СОТРУДНИЧЕСТВА УКРАИНЫ И ЕВРОПЕЙСКОГО СОЮЗА: БИБЛИОМЕТРИЧЕСКИЙ АНАЛИЗ (1995–2010)

*В нашем исследовании сделана попытка оценить динамику публикационной активности ученых Украины за период с 1995 по 2010 годы и проанализировать распределение по странам ЕС совместных научных публикаций украинских и европейских исследователей. В качестве основных источников исходных данных были использованы информационные ресурсы Scirus and Scopus. Кроме того, использовались данные базы данных Web of Science (WoS), которые были взяты из докладов Национального научного фонда США [4] и Всемирного Банка [5]. Результаты оценки динамики числа публикаций украинских исследователей, индексированных в каждой из этих баз данных, обнаруживают существенные различия как по абсолютным значениям, так и по характеру трендов. В случае оценки по данным WoS наблюдается снижение публикационной активности ученых Украины. В то же время, результаты библиометрических измерений в Scirus и Scopus выявляют первоначальный рост, связанный с наполнением индекса, а затем (с 2001 года) более или менее стабильный уровень числа публикаций украинских авторов. Выявленная тенденция стабилизации уровня публикационной продуктивности украинских исследователей несомненно является следствием определенного ряда факторов как интернального, так и экстернального характера. Ранговое распределение стран ЕС по числу совместных научных публикаций украинских и европейских исследователей позволяет достаточно корректно выделить ведущую группу из шести стран, которые имеют с Украиной наиболее результативное научное сотрудничество (Германия, Польша, Франция, Великобритания, Италия и Испания). Ранговые ряды стран, полученные при оценках в Scirus и Scopus, достаточно хорошо коррелируют между собой и могут быть использованы для библиометрического мониторинга международного научного сотрудничества. В методологическом плане нам кажется важным подчеркнуть необходимость учета того факта, что релевантность результатов наукометрических исследований, в частности уровня и тенденций развития национальной науки и международного научного сотрудничества, всегда будет ограничена свойствами используемых баз данных. Поэтому задача создания полных тематических библиографий научных публикаций как информационной платформы наукометрии, на наш взгляд, остается актуальной. Работа выполнена в рамках проекта ЕС «BILAT-UKR*AINA» «Усиление двустороннего научно-технологического партнерства с Украиной» Программы FP7-INCO-2012-2.2 (грант № 311839).*