Performance of research publications in Eastern European countries

The aim of this study is to evaluate and compare the scientific publications output in different East European countries and propose structural academic reforms for improving scientific performance in Russia, Ukraine and Belarus. For this purpose, I have analysed all available statistical information (the earliest year is 1996 and the latest available year at the time of writing this manuscript is 2014) from the bibliographic database *Scopus*[1] to obtain the number of published research papers in different countries, and the UNESCO database[2] for the number of researchers in different countries and evaluated the research performance in the East European countries based on the number of scientific publications per researcher, and the number of citations per published article. Table 1 provides the results of this analysis.

It can be seen from Table 1 that researchers in Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia are impressively more productive than those in Russia, Ukraine and Belarus. For example, in 2014, researchers from Hungary, Latvia and Lithuania were three times more productive than those in Russia, while researchers from Poland were five times more productive than those from Russia.

The analysis of *Scopus*[1] shows that researchers in Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia publish in the same wide range of subject areas as those in Russia, Ukraine and Belarus. The major areas of scientific publications in these countries include physics and astronomy, biochemistry, genetics and molecular biology, engineering, materials science and chemistry. The Eastern European countries have also achieved significant growth in publications in such areas as arts and humanities and social sciences[1].

Also, the research impact (measured by the number of citations per published manuscript) in Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia is higher than in Russia, Ukraine and Belarus for all years and for almost all research areas (except mathe-

matics, physics and astronomy, where Russia, Ukraine and Belarus have a comparable research impact with other Eastern European countries).

The method for analysing low scientific publications performance in Russia, Ukraine and Belarus is based on the following working hypotheses.

(i) The three countries have a deficit of well qualified scientists due to their high emigration rate to the more developed countries with a better standard of living (the 'brain drain' problem).
(ii) They have relatively low funding for research.
(iii) They have inefficient (autocratic and corrupt) academic system (including the archaic Soviet doctoral degree structure) with a lack of incentives for high scientific performance.

To test hypothesis (i), I have analysed all available statistical information from the Organization for Economic Cooperation and Development (OECD) website[3]. The data illustrate that the 'brain drain' problem is common for all Eastern European countries (not only for Russia, Ukraine and Belarus) because scientists in these countries prefer to move to more developed Western Europe and other countries (USA, Canada, Australia) with better living and working conditions. Therefore, the hypothesis (i) is not validated as a major cause of low research performance in Russia, Ukraine and Belarus.

Analysis of the UNESCO data[2] on the gross expenditure on research and development (GERD) per scientist in Eastern Europe shows that Russia, Ukraine and Belarus are comparable with other Eastern European countries with regard to funding for research, and therefore the hypothesis (ii) is not confirmed.

Better research performance in Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia is tied to their democratic reforms and structural changes in the academic system during the 1990s (after the Eastern/Soviet bloc disintegration), i.e. academic freedom (decentralization), transition to research doctorate (Ph D) model and

academic advancement based on international peer-reviewed publications[4].

The present academic systems in Russia, Ukraine and Belarus still keep the archaic Soviet doctoral degree structure[5] and widespread corruption (e.g. in awarding doctoral degrees and academic titles) and lack transparency and incentives for high-quality research and publications. Particularly, the present doctorate system in Russia, Ukraine and Belarus is different from internationally recognized one-level doctoral degree system (Ph D model dedicated to training in research) by inheriting the archaic Soviet two-level doctoral degrees system, which involves minimal training in original research, and does not follow the UNESCO criteria for doctoral education[6].

The first doctorate level 'Candidate of Sciences' degree takes at least 3–4 (and typically more) years of postgraduate 'research', which is completed by submission of dissertation and many extra documents unrelated directly to the content of the dissertation. The dissertation should contain a solution to an existing scientific problem. Additionally, candidates must pass three exams (in the field of specialty, in a foreign language, and in philosophy), but these are not taken seriously neither by the candidates nor by the examination commission and usually are passed by using corrupted schemes[7]. The dissertation is presented at the educational or scientific institutions before a Commission called the Scientific Council. The dissertation must be complemented by comments of several reviewers. In a procedure called the 'defence of the dissertation', the dissertation is summarized before the Scientific Council, followed by speeches of the reviewers or the reading of their reports, and replies to the comments of the reviewers and questions of the Council members by the candidate.

The major problem in this procedure is that neither the reviewers nor the commission members can evaluate the originality of research submitted in dissertation, since they usually do not read international peer-reviewed literature due to a lack of foreign language skills and lack of motivation for high-quality research. Also, it is a part of culture in

Table 1. Research performance in Eastern European countries in comparative perspective

| Country | Scientific publications | | | | Number of citations per published paper (1996–2014) |
| | Total | | Per researcher | | |
	1996	2014	1996	2014	
Bulgaria	2,177	3,480	0.15	0.31	9.1
Croatia	1,670	5,533	0.37	0.83	7.5
Czech Republic	4,772	20,137	0.37	0.61	10.7
Estonia	576	2,562	0.21	0.56	15.8
Hungary	4,276	9,281	0.41	0.39	13.6
Latvia	347	1,380	0.12	0.35	9.5
Lithuania	464	2,877	0.062	0.36	9.7
Poland	11,323	35,951	0.21	0.54	9.6
Romania	1,856	12,563	0.061	0.69	7.2
Slovakia	2,401	6,711	0.24	0.43	9.1
Slovenia	1,378	5,321	0.31	0.59	11.3
Russia	30,560	50,430	0.054	0.11	6.5
Ukraine	5,359	9,218	0.036	0.13	5
Belarus	1,237	1,591	0.053	0.081	6.1

Russia, Ukraine and Belarus to find a 'good' reviewer who can write a positive report regardless of the quality of the dissertation.

The second (higher) doctorate level 'Doctor of Sciences (D Sc)' degree suggests achieving significant scientific results (that can be qualified as a new discovery) and requires the submission and defence of a second dissertation (further to the first doctoral dissertation). In practice however, it turns into decades of extremely unproductive and essentially bureaucratic work, such as preparation of many additional formal documents/ reports for different Boards (before and after submission of the dissertation) and trying to contact members of the dissertation committee to get positive assessments of the dissertation. All these result in academic misconduct (plagiarism) and corruption[8] as well as awarding pseudo research degrees (particularly in social sciences).

Currently, academic advancement in Russia, Ukraine and Belarus is not based on international standards (scientific publications in international peer-reviewed literature), but rather on this archaic Soviet two level doctoral degrees system[9]. The 'Candidate of Sciences' degree may help to acquire the position of Associate Professor in universities, or Researcher/Senior Researcher in scientific institutes. The 'Doctor of Sciences' degree can help to acquire the Full Professor position. But after getting a senior position (Associate or Full Professor), one has to prepare several formal documents and reports for the Scientific Council to acquire special diploma and title of Associate Professor or Full Professor. Thus a lot of valuable time is lost that could be used for research activity instead.

Therefore the hypothesis (iii) is confirmed and to improve the scientific publications performance in Russia, Ukraine and Belarus, these countries should adopt one level doctoral degree system (e.g. Ph D model), anti-corruption measures (e.g. transparency) and international peer-reviewed publications system for academic advancement.

1. http://www.scopus.com (last accessed in July 2015).
2. http://data.uis.unesco.org/ (last accessed in July 2015).
3. https://stats.oecd.org/ (last accessed in July 2015).
4. http://www.eui.eu/ (last accessed in July 2015).
5. Gorobets, A., *Nature*, 2011, **473**, 154.
6. http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf
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9. Gorobets, A., *Science*, 2011, **333**, 523–524.

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