Comments on the article *Research Output of Croatian Universities from 1996 to 2004, Registered by the Science Citation Index-Expanded*

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Letter to the editor *Received: 20 January*, 2006. *Accepted: 20 January*, 2006.

The article: M. Jokic et al. ; *Research Output of Croatian Universities from 1996 to 2004, Registered by the Science Citation Index-Expanded* [1] has acquired considerable interest among the scientists at the University of Rijeka. Such investigations could be very useful and, as pointed out in the article, "could serve as the starting point for further follow-up and in depth studies of the research performance at the (Croatian) Universities".

It is commonly expected that the methodology applied and the data collected in scientific papers are correct. While we could agree with the methodology (The Academic Ranking of World Universities [2]), it turns out that only two factors: Research output and Size of institution are important in the evaluation of Croatian universities. We are presently not able to comment on the factor Research output, because the collection of such data requires a lot of work and we believe that the authors reported correct numbers. However, we are confident in asserting that in [1] the factor Size of institution is completely misleading. Since the authors draw, based strongly on this factor, the conclusion that the productivity in "hard sciences" (ratio of number of papers published in a year vs. number of teachers) is almost five times higher at the University of Zagreb (0,94) than at the University of Rijeka (0,21 – and similarly also for the Universities of Split and Osijek), we have to say that such a statement is incorrect.

In the paper Jokic et al. [1], the Size of institution is determined as the number of teachers (assistant, associate and full professors) working in "hard sciences" at the respective universities in 2004, and the data were collected from the web-pages of the universities. Although we could agree with such a definition of the Size of institution, according to our analysis the given numbers are totally wrong. It is quite obvious that the 20 faculties in "hard sciences" at the University of Zagreb (quoted size: 842) could not have only two times more teachers than the 4 relevant faculties at the University of Rijeka (quoted size: 402)!

To avoid any "self-interpretation", we have taken the data collected officially last year by the Croatian Rectors' Conference and the Croatian Agency for Science and Higher Education, and provided by the universities. According to these sources the number of teachers in "hard sciences" is 1372 for the University of Zagreb (19 faculties included), and 220 for the University

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of Rijeka (4 faculties included). Using these correct data as the Size of institution, we have obtained for the year 2004 a productivity ratio of 0,58 for the University of Zagreb and of 0,39 for the University of Rijeka. This means that the University of Rijeka in comparison with the University of Zagreb has a 67 % productivity per author, and similar numbers could be obtained for the Universities of Split and Osijek. This is a significantly different result from that presented by Jokic et al. [1], and it puts a question whether this article could be relevant at all in discussing the effective contribution of Croatian universities to the "hard sciences" field.

In our opinion, the real challenge would be constituted by the analysis of the still existing difference in productivity per author among the universities in Croatia: how important is the amount of money invested in "hard sciences" per capita by the Ministry of Science and other sources, how to take into account the influence of the "scientific surrounding", what is the real strength of the tradition in "hard sciences", what is the impact of the surrounding industry, etc. Articles taking into account such effects, assuming that they were written correctly and in good faith, would be a real contribution to the evaluation of the impact of Croatian universities to the development of science in Croatia and could thus serve as a starting point for the decision-making process which should improve the contribution of all Croatian scientists to the benefit of the country and of all its citizens.

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