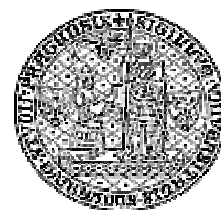


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Publication Portfolio of the Czech Economists and Problems of Rankings

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Publication Portfolio of the Czech Economists and Problems of Rankings

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Abstract:

This paper presents “micro” results of empirical analysis of 1235 individual publication records of 1300 economists in the Czech Republic retrieved from international databases Web of Science and EconLit for the period 1994-2003. Publication portfolio described by research publication flows from particular institutions to particular journals is provided. Algorithms of weighted and not-weighted rankings of institutions by research performance are proposed and applied on Czech data.

Keywords: impact factor, lexicographic ordering, publication portfolio, ranking

JEL: A11, P2

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1. Introduction

More or less sophisticated methodologies of evaluation of the research productivity are being used in the European Union and United States to produce rankings of economic departments reflecting their research performance. There is no reason to expect that the same standards will not be implemented in evaluation of universities and research institutions in the new EU member states, including Czech Republic.

While the first attempt to produce national ranking of American economic research institutions can be attributed to Fusfeld (1956), a boom of national, European and world rankings followed in the last two decades of 20th century, see e.g. Graves, Marchand and Thompson (1982), Kirman and Dahl (1994), Bauwens (1998), Kalaitzidakis, Mamuneas and Stenos (2001), Lubrano, Bauwens, Kirman and Protopopescu (2003), Dolado, Garcia-Romero and Yamarro (2003)..

Analysis of research performance of individuals and institutions became one of topical problems of scientometrics, relatively new discipline focused on measuring and analysing science. Plenty of methods were suggested and applied, including operations research approaches and multi-criteria decision making (see e.g. analysis of country rankings in Kocher, Luptacik, Sutter (2007)). A comprehensive survey of research performance evaluation methods is provided in Gregor (2006).

Surprisingly very little is known about publication performance and publication habits of the Czech economists: demanding methods of research performance evaluation have not yet become a part of academic culture in the Czech Republic. First steps in this direction appeared only during last few years. Partial analysis of publications of Czech economists during 1993-2000 based on records retrieved from database RIV see in Turnovec (2002). A

survey of thematic orientation of economic articles published by authors from the Czech Republic compared to the rest of Europe see in Macháček (2004).

The first attempt, focused on comparative research performance of the Czech economists, took place in 2004-2006 within the project of the Grant Agency of the Czech Republic “Microeconomics of university education and measuring research performance of the universities”. Methodology and aggregated results of evaluation of all over publication and citation performance of the Czech economic community (both on institutional and individual level) for the period 1994-2003 were published in Turnovec (2005). Múnich (2006) in his comment criticized egalitarian approach of used methodology and proposed to introduce categories of “core economics” journals and “broad-economics” journals, leading to different (more elitist) ranking results with focus on quality of publications. Publication performance of the professors of economics promoted during 1998-2005 was studied by Macháček and Kolcunová (2005). Analysis of Slovak economists and research institutions performance was provided in Cianan, Pokrivcak and Rajcaniova (2005). The broader context of used Czech and Slovak methodologies was examined in Gregor and Schneider (2005).

In this paper we present “micro” results of empirical analysis of 1235 individual publication records of the economists in the Czech Republic retrieved from international databases Web of Science and EconLit. We are trying to answer the following question: what is the portfolio of target journals of the Czech economics researchers? Second part of the paper attempts to formulate a more general model of ranking problem. Different types of rankings are proposed within the same conceptual framework covering both elitist and egalitarian approaches. Their application to existing data leads to alternative rankings expressing different perceptions of “quantity versus quality” problem.

2. Empirical data

Main objective of the project was to compare measurable research outputs of the faculties of economics, institutes and/or departments of economics at non-economic faculties or non-university economic research institutions measured by their presence at international academic markets in the period of 10 years, 1994-2003.

Publication output was defined as a bibliographic record in international databases (Econlit, Web of Science). After excluding editorial notes, book reviews, conference reports, obituaries and similar non-research contributions, we analyzed a total of 1235 articles of the Czech economists (papers in scientific journals and chapters in books) recorded by Web of

Science and EconLit. We did not restrict the search on journals and other sources classified as “economics”, any research publication of authors considered was included (mathematics, political sciences, sociology, and even medicine). In the case of duplicity records (the same record in Web of Science and EconLit) such record was considered only once. 1216 economists were included affiliated with 24 Czech Republic academic institutions engaged in economic research and education (including non-Czech citizens with permanent position in the Czech institutions) and 14 “free lancers” (economists affiliated with public service institutions, financial institutions etc.). Among 1230 economists considered only 251 (slightly more than 20%) had at least one record in publication databases.

For the purpose of this paper we concentrated attention on research productivity of 20 public faculties of economics and university institutes/departments of economics on non-economics faculties (see Table 1), employing 1141 pedagogical and research faculty. The complement of 89 economists not affiliated with public university institutions we aggregated into one group, “others” (the research fellows of Czech National Bank, department of econometrics of UTIA, Newton College, Centre of Economic Studies of VSEM and not-affiliated).¹

Table 1
Institutions considered

| Institution | Faculty | Abbreviation |
|---|---------|--------------|
| UK v Praze, Institut ekonomických studií FSV | 22 | UK FSV IES |
| UK v Praze, Centrum pro ekonomický výzkum a doktorské studium & AVČR, Národohospodářský ústav | 21 | CERGE-EI |
| VŠE, Fakulta financí a účetnictví | 78 | VSE FFU |
| VSE, Fakulta mezinárodních vztahů | 78 | VSE FMV |
| VŠE, Fakulta podnikohospodářská | 86 | VSE FPH |
| VŠE, Fakulta informatiky a statistiky | 85 | VSE FIS |
| VŠE, Fakulta národohospodářská | 38 | VSE FNH |
| VSE, Fakulta managementu | 35 | VSE FM |
| MU Brno, Ekonomicko-správní fakulta | 26 | MU ESF |
| Univerzita Pardubice, Fakulta ekonomicko-správní | 65 | UP FES |
| Univerzita Hradec Králové, Fakulta informatiky a managementu | 13 | UHK FIM |
| VŠB – TU Ostrava, Ekonomická fakulta | 144 | VSB EF |
| Západočeská univerzita, Fakulta ekonomická | 54 | ZCU FE |
| Jihočeská univerzita, ekonomické katedry Zemědělské fakulty | 46 | JCU FZ |
| Technická univerzita, Liberec, Hospodářská fakulta | 36 | TUL HF |
| Slezská univerzita v Opavě, Obchodně podnikatelská fakulta | 42 | SUO OPF |

¹ The changes in affiliation of individuals with evaluated institutions during the analyzed period were not considered, affiliation in the end of 2003 was significant. Also multiple affiliations were ignored; each person was allocated to a single institution, based on a permanent (full-time) contract.

| | | |
|--|-----|----------|
| Univerzita Tomáše Bati ve Zlíně, Fakulta managementu a ekonomiky | 57 | UTB FME |
| Česká zemědělská univerzita, Provozně-ekonomická fakulta | 111 | CZU FPE |
| Mendelova zemědělská a lesnická univerzita v Brně, Provozně ekonomická fakulta | 75 | MZU FPE |
| Univerzita J. E. Turkyň, Fakulta sociálně ekonomická | 29 | UJEP FSE |
| Others (CNB, UTIA, CES VSEM, Newton College, not affiliated) | 89 | Others |

To involve qualitative aspects of assessment of publications we used for each journal publication record so called impact factor. Impact factor, invented by Garfield (1972), is a measure of the frequency with which the “average article” in a journal has been cited in a particular time period. In this sense it provides information about “impact” or scientific influence of the journal. While impact factor itself is not an assessment of a particular paper, but of the journal, it is plausible to expect that a paper published in the journal with higher impact factor has higher chance to be noticed and used by other researchers than a paper published in the journal with lower impact factor. We used so called two-year impact factor (IF₂) from year 2003 by Journal Citation Reports (JCR)². For journal *J* it is defined as follows:

$$IF_J = \frac{\text{number of 2003 citations of articles published in } J \text{ in 2001 – 2002}}{\text{total number of articles published in } J \text{ in 2001 – 2002}}$$

All publication records retrieved from Web of Science database are reporting publications in journals with non-zero impact factors. We also used the EconLit database reporting also articles in selected not-impacted journals³ and books/chapters from books selected on the basis of Annotated Listing of New Books from Journal of Economic Literature, dissertations defended at American universities and working papers of selected institutions. Only production of prestigious academic publishers (Academic Press, Springer, Kluwer, Edward Elgar, McMillan etc.) is included. It is waste of time to look in Web of Science and/or EconLit databases for articles or books published elsewhere.

3. Publication portfolio

In Tables 2-5 we list all impacted journals with at least one record of publication of the Czech economists sorted by institutions from Table 1. Column IF in the tables stands for the impact factor of the corresponding journal.

² Journal Citation Reports, published by Thomson Scientific (Institute for Scientific Information), covers over 7500 of the world’s most highly cited, peer-reviewed journals in approximately 200 disciplines. The database is regularly updated on the basis of extensive evaluation process. The necessary (but not sufficient) conditions for inclusion a journal are article titles in English, English abstracts, and keywords.

³ Prague Economic Papers is the only Czech not impacted journal included in EconLit database.

Impacted journals are sorted into four clusters by their impact factors: cluster A - journals with impact factors greater than 1 (Table 2), cluster B - journals with impact factors between 0,5 and 1 (Table 3), cluster C - journals with impact factor between 0,25 and 0,5 (Table 4) and cluster D - journals with positive impact factors less than 0,25 (Table 5). Table 5 includes also not-impacted reported publications, separately in Prague Economic Papers and “others” (mostly chapters in books). Eventual co-authorship and size of publications are not considered.

Table 2

Cluster A, Publications in impacted journals with impact factor greater than 1 (1994-2003)

| JOURNAL | IF | PUBLIC FACULTIES AND INSTITUTES OF ECONOMIC EDUCATION | | | | | | | | | | | | | | | | | OTHERS | TOTAL | | | | |
|--|-------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--------|-------|-----|----|-----|-----|
| | | CERGE | UK | | | | | | | | | | | | | | | | | | | | | |
| | | | FSV | VSE | VSE | VSE | VSE | VSE | VSE | VSE | VSF | MU | TUL | SUO | JCU | CZU | MZU | UJEP | | | ZCU | UP | UHK | UTB |
| IES | FNH | FFU | FIS | FPH | FM | FMV | EF | EF | HF | OPF | FZ | FPE | FPE | FSE | FE | FES | FIM | FME | | | | | | |
| ADDICTION | 3,241 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF ECONOMIC PERSPECTIVES | 2,677 | 2 | | | | | | | | | | | | | | | | | | | | | 0 | 2 |
| INDUSTRIAL & LABOR RELATIONS REVIEW | 1,301 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| REVIEW OF ECONOMICS AND STATISTICS | 1,266 | 2 | | | | | | | | | | | | | | | | | | | | | 1 | 3 |
| SCIENTOMETRICS | 1,251 | | 3 | | | | | | | | | | | | | | | | | | | | 0 | 3 |
| JOURNAL OF DEMOCRACY | 1,24 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| INTERNATIONAL JOURNAL OF MEDICAL INFORMATICS | 1,178 | | | | | | | | 1 | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF ECONOMETRICS | 1,135 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF URBAN ECONOMICS | 1,068 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| SOCIOLOGY OF EDUCATION | 1,048 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| LIVESTOCK PRODUCTION SCIENCE | 1,028 | | | | | | | | | | | | | 1 | | | | | | | | | 0 | 1 |
| EUROPEAN ECONOMIC REVIEW | 1,021 | 2 | | | | | | | | | | | | | | | | | | | | | 1 | 3 |
| JOURNAL OF APPLIED PROBABILITY | 1,014 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| Total | | 10 | 3 | | | | | 1 | | | | | | 1 | | | | | | | | | 5 | 20 |

Table 3
Cluster B, publications in impacted journals with impact factor among 0.5 and 1 (1994-2003)

| JOURNAL | IF | PUBLIC FACULTIES AND INSTITUTES OF ECONOMIC EDUCATION | | | | | | | | | | | | | | | | | | OTHERS | Σ | | | |
|---|-------|---|------------|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|------|-----|-----|--------|---|-----|-----|----|
| | | UK | | VSE | VSE | VSE | VSE | VSE | VSE | VSB | MU | TUL | SUO | JCU | CZU | MZU | UJEP | ZCU | UP | | | UHK | UTB | |
| | | CERGE | FSV IES | FNH | FFU | FIS | FPH | FM | FMV | EF | EF | HF | OPF | FZ | FPE | FPE | FSE | FE | FES | | | FIM | FME | |
| INTERNATIONAL JOURNAL OF INTELLIGENT SYSTEMS | 0,875 | | | | | | | 1 | | | | | | | | | | | | | | 0 | 1 | |
| RATIONALITY AND SOCIETY | 0,867 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF BUSINESS VENTURING | 0,852 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| INTERNATIONAL ECONOMIC REVIEW | 0,84 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| ANNALS OF MATHEMATICS AND ARTIFICIAL INTELLIGENCE | 0,837 | | | | | | | 1 | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF DEVELOPMENT ECONOMICS | 0,832 | 2 | | | | | | | | | | | | | | | | | | | | | 0 | 2 |
| OXFORD ECONOMIC PAPERS-NEW SERIES | 0,824 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| PATTERN RECOGNITION LETTERS | 0,809 | | | | | | | | | | | | | | 1 | | | | | | | | 0 | 1 |
| JOURNAL OF PUBLIC ECONOMICS | 0,786 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF EVOLUTIONARY ECONOMICS | 0,778 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| JOURNAL OF COMPARATIVE ECONOMICS | 0,746 | 3 | | | | | | | | | | | | | | | | | | | | | 4 | 7 |
| COMPUTATIONAL STATISTICS & DATA ANALYSIS | 0,711 | | 1 | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| ENVIRONMENTAL & RESOURCE ECONOMICS | 0,702 | | | 2 | | | | | | | | | | | | | | | | | | | 0 | 2 |
| JOURNAL OF EUROPEAN SOCIAL POLICY | 0,7 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| REGIONAL SCIENCE AND URBAN ECONOMICS | 0,694 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF ECONOMIC DYNAMICS & CONTROL | 0,69 | 1 | 1 | | | | | | | | | | | | | | | | | | 1 | | 0 | 3 |
| POST-SOVIET GEOGRAPHY AND ECONOMICS | 0,677 | | 1 | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| INTERNATIONAL JOURNAL OF GAME THEORY | 0,653 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| EUROPEAN JOURNAL OF OPERATIONAL RESEARCH | 0,605 | | 1 | | | 1 | | | | 1 | | | | | | | | | | | | | 0 | 3 |
| REVIEW OF ECONOMIC DYNAMICS | 0,6 | 1 | | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF OPTIMIZATION THEORY AND APPLICATIONS | 0,583 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| CYBERNETICS AND SYSTEMS | 0,581 | | | | | 1 | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF BUSINESS ETHICS | 0,58 | | | | | | | | | | | | | | | | | | | | | | 2 | 2 |
| MANAGEMENT LEARNING | 0,568 | | | | | | | 1 | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF ECONOMIC BEHAVIOR & ORGANIZATION | 0,566 | 3 | | | | | | | | | | | | | | | | | | | | | 0 | 3 |
| RURAL SOCIOLOGY | 0,561 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| SMALL BUSINESS ECONOMICS | 0,534 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| | | 16 | 4 | 2 | 0 | 2 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 12 | 42 |

Table 4, Cluster C, publications in impacted journals with impact factor among 0.25 and 0.5 (1994-2003)

| JOURNAL | IF | PUBLIC FACULTIES AND INSTITUTES OF ECONOMIC EDUCATION | | | | | | | | | | | | | | | | | | | OTHERS | Σ |
|--|-------|---|------------|------------|------------|------------|------------|-----------|------------|-----------|----------|-----------|------------|-----------|------------|------------|-------------|-----------|-----------|------------|--------|-----|
| | | CERGE -EI | FSV IES | VSE FNH | VSE FFU | VSE FIS | VSE FPH | VSE FM | VSE FMV | VSB EF | MU EF | TUL HF | SUO OPF | JCU FZ | CZU FPE | MZU FPE | UJEP FSE | ZCU FE | UP FES | UHK FIM | | |
| EUROPE-ASIA STUDIES | 0,475 | | | | | | | 1 | | | | | | | | | | | | | 0 | 1 |
| ANNALS OF THE INSTITUTE OF STATISTICAL MATHEMATICS | 0,468 | | 2 | | | | | | | | | | | | | | | | | | 0 | 2 |
| KYKLOS | 0,449 | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 |
| RUSSIAN AND EAST EUROPEAN FINANCE AND TRADE | 0,444 | | | | 2 | | | | | | | | | | | | | | | | 1 | 3 |
| JOURNAL OF INSTITUTIONAL AND THEORETICAL ECONOMICS | 0,407 | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 |
| SOCIOLOGICAL QUARTERLY | 0,397 | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| JOURNAL OF AGRICULTURAL ECONOMICS | 0,39 | | 2 | | | | | | | | | | | | | | | | | | 0 | 2 |
| JOURNAL OF FUTURES MARKETS | 0,39 | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| JOURNAL OF HIGHER EDUCATION | 0,375 | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 |
| JOURNAL OF ECONOMIC ISSUES | 0,373 | | | | | | | | | 2 | | | | | | | | | | | 0 | 2 |
| ECONOMICS OF TRANSITION | 0,367 | 6 | | | | | | 1 | | | | | | | | | | | | | 5 | 12 |
| SOUTHERN ECONOMIC JOURNAL NONPROFIT AND VOLUNTARY SECTOR QUARTERLY | 0,361 | 2 | | | | | | | | | | | | | | | | | | | 0 | 2 |
| COMMUNIST AND POST-COMMUNIST STUDIES | 0,355 | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 |
| ECONOMICS LETTERS | 0,34 | | 1 | | | | | | | | | | | | | | | | | | 1 | 2 |
| ECONOMICS LETTERS | 0,337 | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 |
| FUZZY SETS AND SYSTEMS | 0,323 | | | | | | | | | | | | | | | | | | | | 4 | 4 |
| KYBERNETIKA | 0,319 | 1 | 2 | | 2 | | | | | | | | | | 1 | | | | | | 10 | 16 |
| JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS | 0,312 | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| DISCRETE MATHEMATICS | 0,303 | | | | | | | | | | | | | | 1 | | | | | | 0 | 1 |
| ECONOMIC INQUIRY | 0,301 | 2 | | | | | | | | | | | | | | | | | | | 0 | 2 |
| ZEITSCHRIFT FUR ANGEWANDTE MATHEMATIK UND MECHANIK | 0,301 | | | | | | | | | | | | | | | | | | | | 4 | 4 |
| PUBLIC CHOICE | 0,297 | 1 | | | | | | | | | | | | | | | | | | | 1 | 2 |
| EASTERN EUROPEAN ECONOMICS | 0,293 | 2 | | 2 | 2 | | | | | 3 | | | 1 | | | | | | | | 31 | 41 |
| COMPUTATIONAL STATISTICS | 0,282 | | 1 | | | | 1 | | | | | | | | | | | | | | 0 | 2 |
| EMERGING MARKETS FINANCE AND TRADE | 0,273 | 1 | 1 | | | | | | | | | | | | | | | | | | 0 | 2 |
| CURRENT PSYCHOLOGY OF COGNITION | | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 |
| INTERNATIONAL JOURNAL OF UNCERTAINTY | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| Total | | 21 | 9 | 2 | 4 | 2 | 0 | 1 | 2 | 3 | 2 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 61 | 110 |

Table 5
Cluster D, publications in journals with impact factor less than 0.25 (1994-2003)

| JOURNAL | IF | PUBLIC FACULTIES AND INSTITUTES OF ECONOMIC EDUCATION | | | | | | | | | | | | | | | | | | OTHERS | TOTAL | | |
|---|-------|---|------------|------------|------------|------------|------------|-----------|------------|-----------|----------|-----------|------------|-----------|------------|------------|-------------|-----------|-----------|--------|-------|------------|------------|
| | | UK CERGE | FSV IES | VSE FNH | VSE FFU | VSE FIS | VSE FPH | VSE FM | VSE FMV | VSB EF | MU EF | TUL HF | SUO OPF | JCU FZ | CZU FPE | MZU FPE | UJEP FSE | ZCU FE | UP FES | | | UHK FIM | UTB FME |
| JOURNAL OF ECONOMIC EDUCATION | 0,239 | 1 | | | | | | | | | | | | | | | | | | | 0 | 1 | |
| ECONOMIC MODELLING | 0,236 | | | | | | | | | | | | | | | | | | 1 | | 0 | 1 | |
| POLITICKA EKONOMIE | 0,235 | 21 | 31 | 35 | 39 | 51 | 12 | | 29 | 10 | 5 | 3 | | 2 | 2 | 2 | 1 | | | | 128 | 371 | |
| CESKOSLOVENSKA PSYCHOLOGIE | 0,232 | | | | | | | | | | | | | | | | | | | | 1 | 1 | |
| CZECH JOURNAL OF ANIMAL SCIENCE | 0,217 | | | | | | | | | | | | | | 3 | | | | | | | 0 | 3 |
| INTERNATIONAL TAX AND PUBLIC FINANCE | 0,215 | | | | 2 | | | | | | | | | | | | | | | | | 0 | 2 |
| COMPUTATIONAL INTELLIGENCE | 0,203 | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| STATISTICAL PAPERS | 0,203 | | | | | 2 | | | | | | | | | | | | | | | | 0 | 2 |
| APPLIED ECONOMICS | 0,2 | 2 | | | | | | | | | | | | | | | | | | | | 0 | 2 |
| JOURNAL OF POLITICAL & MILITARY SOCIOLOGY | 0,2 | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| JOURNAL OF MACROECONOMICS | 0,179 | 1 | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| INTERNATIONAL JOURNAL OF GENERAL SYSTEMS | 0,172 | | | | | | | 1 | | | | | | | | | | | | | | 0 | 1 |
| HISTORY OF POLITICAL ECONOMY | 0,142 | 1 | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| FINANCE A UVER | 0,112 | 21 | 27 | 2 | 20 | 2 | 1 | 1 | 1 | 19 | 2 | 3 | 1 | | | | 1 | | | | | 141 | 242 |
| CONTROL AND CYBERNETICS | 0,101 | | 1 | | | | | | | 3 | | | | | | | | | | | | 0 | 4 |
| SOCIOLOGICKY CASOPIS | 0,063 | | | | | | | | | | | | | | | | | | | | | 9 | 9 |
| EKONOMICKY CASOPIS | 0,062 | 1 | 1 | 1 | 1 | 1 | 1 | | 4 | 3 | 2 | | 2 | 2 | | | | 1 | | | | 0 | 20 |
| STUDIES IN NONLINEAR DYNAMICS AND ECONOMETRICS | 0,034 | 1 | | | | | | | | | | | | | | | | | | | | 0 | 1 |
| PRAGUE ECONOMIC PAPERS | 0 | 9 | 15 | 6 | 9 | 9 | 4 | | 6 | | | | | | | | | | | 2 | | 45 | 105 |
| Others | 0 | 77 | 65 | 4 | 4 | 12 | 6 | 2 | 18 | 29 | 2 | 0 | 2 | 0 | 5 | 1 | 1 | 0 | 3 | 9 | 3 | 51 | 294 |
| Total | | 135 | 140 | 48 | 75 | 77 | 24 | 4 | 61 | 61 | 11 | 6 | 5 | 4 | 10 | 3 | 3 | 1 | 3 | 12 | 3 | 377 | 1063 |

4. Problems of rankings

Many different ways how to rank institutions, countries, journals, individuals on the basis of their research activities, publications, intellectual influence etc. had been proposed, implemented and discussed. There is no generally accepted methodology. In this section we formulate problem of ranking as a general mathematical problem, introduce various ranking rules, propose lexicographical ranking based on classification of activities (outputs) into different qualitative groups and apply several ranking procedures on our empirical data.⁴

4.1 Ranking problem

Let

I be a set of ranked units ($i = 1, 2, \dots, n$),

M a set of activities ($j = 1, 2, \dots, m$),

Π a set of all partitions of I,

O a set of all orderings = set of all permutations of partitions from Π .

By

$$\mathbf{x}_i = (x_{i1}, x_{i2}, \dots, x_{im})$$

we shall denote the i -th activity vector, vector of intensities of activities of unit I, and by

$$\mathbf{x} = (x_1, x_2, \dots, x_n)$$

collection of activity vectors of all units. We assume that $x_{ij} \geq 0$, so $\mathbf{x}_i \in \mathbf{R}_m^+$ and $\mathbf{x} \in X$ where X is n -tuple Cartesian product of \mathbf{R}_m^+ , the space of collections of activity vectors. The system

$$\{I, M, O, X\}$$

we shall call a general ranking problem.

Let

$$F: X \rightarrow O$$

be a mapping of the space X of all collection of activity vectors into the set of orderings. This mapping, assigning to any $\mathbf{x} \in X$ an ordering from O we shall term a ranking rule – any rule describing how to choose from O on the basis of X .

There exist many ranking rules, ways how to select an ordering on the basis of collection of activity vectors.

⁴Terminological comment: by ranking we shall call process of evaluation itself, result of this process being an ordering.

4.2 Ranking of publication media, impact factors

Let

- \mathfrak{S} be a universe of media (journals etc.),
 $J \subseteq \mathfrak{S}$ finite subset of media, taken into consideration in evaluation,
 $c_{ij}(T_1, T_2)$ number of citations of articles published in medium i in period T_1 cited by medium j during a considered period T_2 ,
 $a_i(T_1)$ number of articles published in medium i in a considered period T_1
connected time intervals such that T_1 precedes T_2 [e.g. $T_1 = (r_1, r_2)$, $T_2 = (r_3, r_4)$, $r_3 \geq r_2 + 1$, $r_4 \geq r_3$, $r_1 \leq r_2$, r are the years].

Then

$$\sum_{j \in J} c_{ij}(T_1, T_2)$$

is the number of all citations of articles published in medium i in period T_1 in all media $j \in J$ in period T_2 , and

$$\Phi_i(J, C, a, T_1, T_2) = \frac{\sum_{j \in J} c_{ij}(T_1, T_2)}{a_i(T_1)}$$

assigns to each medium a value that expresses an average number of citations of its articles published in T_1 in medias J in period T_2 . Value Φ_i is usually called an (T_1, T_2) -impact factor of media i , measuring a relative influence of the journal i . Depending on selection of T_1 and T_2 we obtain different impact factors. Auto-citations might be excluded, but it is usually not the case. Impact factor mapping without auto-citations:

$$\Phi_i(J, C, a, T_1, T_2) = \frac{\sum_{j \in J, i \neq j} c_{ij}(T_1, T_2)}{a_i(T_1)}$$

Impact factor mapping Φ defines an ordering $J(\Phi)$ of the set J of the media

$$J(\Phi) = (J_1(\Phi), \dots, J_k(\Phi), \dots, J_n(\Phi))$$

where $n \leq \text{card}(J)$ such that $\Phi_r > \Phi_s$ for any $s > r$, providing the ranking of media (groups of media with the same impact factor).

4.3 Ranking of research performance

As before, let

| | |
|----------------------------|--|
| $J \subseteq \mathfrak{S}$ | be a finite subset of media, taken into consideration in evaluation, |
| I | set of units to be evaluated (institutions, individuals etc.), |
| P_{ij} | set of publications of unit $i \in I$ in medium $j \in J$, |
| R | ranking structure (a partition of J defining a ranking on J), |
| n_i | number of agents in unit $i \in I$. |

a) Not-weighted rankings

Let

$$R = (R_1, \dots, R_k, \dots, R_n)$$

be a ranking structure such that for any $r < t$ a publication in R_s is considered “more valuable” than publication in R_t . Sets R_k we shall term ranking categories. Let us denote $p_{ij} = \text{card } P_{ij}$, then

$$p_i(R_k) = \sum_{j \in R_k} p_{ij}$$

is a number of publications of unit i in ranking category R_k , and vector

$$\mathbf{p}_i(R) = (p_i(R_1), p_i(R_2), \dots, p_i(R_n))$$

we shall call an (absolute) publication portfolio of unit i with respect to a ranking structure R . Then

$$\pi_i(R_k) = \frac{1}{n_i} p_i(R_k)$$

is “per capita” (“per agent”) number of publications of unit i in category R_k and

$$\boldsymbol{\pi}_i(R) = (\pi_i(R_1), \pi_i(R_2), \dots, \pi_i(R_n))$$

we shall call a relative publication portfolio of unit i with respect to ranking structure R . Then, we can define a ranking partition on I in such a way that for any $u, v \in I$

$$u \succ v \text{ if and only if } \mathbf{p}_u(R) \underset{R}{lex} > \mathbf{p}_v(R)$$

(lexicographical ordering). If $\mathbf{x}, \mathbf{y} \in R_n$, then $\mathbf{x} \underset{R}{lex} > \mathbf{y}$ if the first non-zero element of $\mathbf{x} - \mathbf{y}$ is positive.

Choice of J and of ranking partition R determines a level of elitism/egalitarianism of ranking. For example, definition of J as the set of all publication in EconLit database produces less elitist ranking than selection of J on the basis of records in Web of Science. Selection of R with R_1 consisting of 8 “most prestigious” journals (American Economic Review, Journal

of Economic Theory, Econometrica, Journal of Political Economy, Quarterly Journal of Economics, Review of Economic Studies, International Economics Review, Review of Economics and Statistics - so called “blue ribbon 8”, Dusansky and Vernon 1998) generates the most elitist ranking independently on how other categories R_k are defined. On the other hand choice of $J = \emptyset$ and $R_1 = J$ generates the most egalitarian ranking. One of the possible ranking structures is classification of journals on “core economics” and “broad economics” (as in Múnich, 2006).

b) Weighted rankings

Frequently there is a call for more detailed differentiation by weighting each individual publication. Problem is how to select the weights.

The simplest way is to use impact factors of journals in which publications appeared. . Using impact factor journal partition $J(\Phi)$ with weights of publications equal to impact factors, we have

$$w_i(R) = \sum_{k=1}^m \sum_{j \in J_k(\Phi)} \Phi_j p_{ij}$$

the the total score (sum of impact factors of all publications of unit i), where m is the size of impact factor partition (number of groups of media with the same impact factor), and

$$\omega_i(R) = \frac{1}{n_i} \sum_{k=1}^m \sum_{j \in J_k(\Phi)} \Phi_j p_{ij}$$

“per capita” score of unit i.

We can combine impact factor weights with lexicographical ranking based on any ranking partition R. If in partition R each category is a subset of J, and p_{ijt} is a number of publications of unit i in ranking category R_k published in media from the group $J_t(\Phi)$, we have

$$w_i(R_k) = \sum_{t=1}^m \sum_{j \in R_k} \Phi_t p_{ijt}$$

(total score of unit i in category R_k), and

$$\omega_i(R_k) = \frac{1}{n_i} \sum_{t=1}^m \sum_{j \in R_k} \Phi_t p_{ijt}$$

(“per capita” score of unit i in category R_k).

5. Application of different ranking rules on Czech data 1994-2003

In empirical analyses based on for ranking categories A, B, C and D we are using four ranking rules:

a) Simple not-weighted ranking using trivial ranking structure $R = (A \cup B \cup C \cup D)$, i.e. one ranking category consisting of all recorded publications, ordering by per capita number of publications. Institution x is “better” than institution y if it has more per capita publications than y. The most egalitarian rule, quality factor not considered

b) Simple weighted ranking using trivial ranking structure $R = (A \cup B \cup C \cup D)$, i.e. one ranking category consisting of all recorded publications, weights equals to impact factors of journals where publications appeared, ordering by per capita score (sum of impact factors of all publications per one faculty member); institution x is better than institution y if it has more per capita score generated by all publications than institution y. Here not impacted publications are not considered, quality aspect introduced by impact factors.

c) Not-weighted lexicographical ranking using nontrivial ranking structure $R = (A, B, C, D)$, ordering by per capita number of publications in different categories using lexicographical rule. (i) institution x is better than institution y if x has more per capita publications in A than y has independently on how many publications it has in other categories, (ii) if x and y have the same number of per capita publications in A, than institution x is better than institution y if it has more per capita publications in B, independently on how many publications it has in categories C and D, etc. All publications considered including not-impacted ones, Quality aspect introduced by nontrivial ranking structure.

d) Weighted lexicographical ranking using nontrivial ranking structure $R = (A, B, C, D)$ ordering by per capita score (sum of impact factors of publications per one faculty) in different categories using lexicographical rule: (i) institution x is better than institution y if x has greater per capita score generated by publications in A than y has, independently on score in other categories, (ii) if x and y have the same per capita score in A, than institution x is better than institution y if it has greater per capita score in B, independently on score it has in categories C and D, etc. Quality aspect introduced both by ranking structure and impact factor weights.

In Table 6, 7, 8 and 9 we provide these four rankings of the Czech institutions based on publication portfolio from Tables 2 – 5. Our analysis is focused on university institutions. For comparison we are providing data of group “others”, not including it into the rankings.

Table 6
Simple (egalitarian) not-weighted ranking of institutions (all publications form one group)

| Ordering | # of publications in groups | | | | Total publications | Faculty | Per capita publications in ranking categories | | | | Per capita Total | |
|------------|-----------------------------|----|----|-----|--------------------|---------|---|----------|----------|----------|------------------|----------|
| | A | B | C | D | | | A | B | C | D | | |
| CERGE-EI | | 10 | 16 | 21 | 135 | 182 | 21 | 0,47619 | 0,761905 | 1 | 6,428571 | 8,666667 |
| UK FSV IES | | 3 | 4 | 9 | 140 | 156 | 22 | 0,136364 | 0,181818 | 0,409091 | 6,363636 | 7,090909 |
| VSE FNH | | 0 | 2 | 2 | 48 | 52 | 38 | 0 | 0,052632 | 0,052632 | 1,263158 | 1,368421 |
| VSE FFU | | 0 | 0 | 4 | 75 | 79 | 78 | 0 | 0 | 0,051282 | 0,961538 | 1,012821 |
| UHK FIM | | 0 | 1 | 0 | 12 | 13 | 13 | 0 | 0,076923 | 0 | 0,923077 | 1 |
| VSE FIS | | 0 | 2 | 2 | 77 | 81 | 85 | 0 | 0,023529 | 0,023529 | 0,905882 | 0,952941 |
| VSE FMV | | 0 | 0 | 2 | 61 | 63 | 78 | 0 | 0 | 0,025641 | 0,782051 | 0,807692 |
| MU EF | | 0 | 0 | 2 | 11 | 13 | 26 | 0 | 0 | 0,076923 | 0,423077 | 0,5 |
| VSB EF | | 0 | 1 | 3 | 61 | 65 | 144 | 0 | 0,006944 | 0,020833 | 0,423611 | 0,451389 |
| VSE FPH | | 0 | 1 | 0 | 24 | 25 | 86 | 0 | 0,011628 | 0 | 0,27907 | 0,290698 |
| VSE FM | | 1 | 2 | 1 | 4 | 8 | 35 | 0,028571 | 0,057143 | 0,028571 | 0,114286 | 0,228571 |
| TUL HF | | 0 | 0 | 0 | 6 | 6 | 36 | 0 | 0 | 0 | 0,166667 | 0,166667 |
| SUO OPF | | 0 | 0 | 1 | 5 | 6 | 42 | 0 | 0 | 0,02381 | 0,119048 | 0,142857 |
| CZU FPE | | 1 | 1 | 2 | 10 | 14 | 111 | 0,009009 | 0,009009 | 0,018018 | 0,09009 | 0,126126 |
| UJEP FSE | | 0 | 0 | 0 | 3 | 3 | 29 | 0 | 0 | 0 | 0,103448 | 0,103448 |
| JCU FZ | | 0 | 0 | 0 | 4 | 4 | 46 | 0 | 0 | 0 | 0,086957 | 0,086957 |
| UTB FME | | 0 | 0 | 0 | 3 | 3 | 57 | 0 | 0 | 0 | 0,052632 | 0,052632 |
| UP FES | | 0 | 0 | 0 | 3 | 3 | 65 | 0 | 0 | 0 | 0,046154 | 0,046154 |
| MZU FPE | | 0 | 0 | 0 | 3 | 3 | 75 | 0 | 0 | 0 | 0,04 | 0,04 |
| ZCU FE | | 0 | 0 | 0 | 1 | 1 | 54 | 0 | 0 | 0 | 0,018519 | 0,018519 |
| OTHERS | | 5 | 12 | 61 | 377 | 455 | 89 | 0,05618 | 0,134831 | 0,685393 | 4,235955 | 5,11236 |
| Total | | 20 | 42 | 110 | 1063 | 1235 | 1230 | 0,01626 | 0,034146 | 0,089431 | 0,864228 | 1,004065 |

Table 7

Simple IF weighted ranking of institutions (all publications form one group, IF used as weights)

| Ordering | # of publications in groups | | | | Total publi- cations | Faculty | Score weighted by IF | | | | Score total A+B+C+D | Per capita score in groups | | | | Per capita score total |
|------------|-----------------------------|----|-----|------|----------------------------|---------|----------------------|--------|--------|---------|------------------------|----------------------------|----------|----------|----------|---------------------------|
| | A | B | C | D | | | A | B | C | D | | A | B | C | D | |
| CERGE-EI | 10 | 16 | 21 | 135 | 182 | 21 | 16,673 | 11,554 | 7,179 | 8,343 | 43,749 | 0,793952 | 0,55019 | 0,341857 | 0,397286 | 2,083286 |
| UK FSV IES | 3 | 4 | 9 | 140 | 156 | 22 | 3,753 | 2,683 | 3,249 | 10,472 | 20,157 | 0,170591 | 0,121955 | 0,147682 | 0,476 | 0,916227 |
| VSE FNH | 0 | 2 | 2 | 48 | 52 | 38 | 0 | 1,492 | 0,586 | 8,511 | 10,589 | 0 | 0,039263 | 0,015421 | 0,223974 | 0,278658 |
| VSE FFU | 0 | 0 | 4 | 75 | 79 | 78 | 0 | 0 | 1,474 | 11,897 | 13,371 | 0 | 0 | 0,018897 | 0,152526 | 0,171423 |
| VSE FIS | 0 | 2 | 2 | 77 | 81 | 85 | 0 | 1,186 | 0,638 | 12,677 | 14,501 | 0 | 0,013953 | 0,007506 | 0,149141 | 0,1706 |
| VSE FMV | 0 | 0 | 2 | 61 | 63 | 78 | 0 | 0 | 0,842 | 7,478 | 8,32 | 0 | 0 | 0,010795 | 0,095872 | 0,106667 |
| VSE FM | 1 | 2 | 1 | 4 | 8 | 35 | 1,178 | 1,712 | 0,282 | 0,284 | 3,456 | 0,033657 | 0,048914 | 0,008057 | 0,008114 | 0,098743 |
| MU EF | 0 | 0 | 2 | 11 | 13 | 26 | 0 | 0 | 0,746 | 1,523 | 2,269 | 0 | 0 | 0,028692 | 0,058577 | 0,087269 |
| UHK FIM | 0 | 1 | 0 | 12 | 13 | 13 | 0 | 0,69 | 0 | 0,236 | 0,926 | 0 | 0,053077 | 0 | 0,018154 | 0,071231 |
| VSF EF | 0 | 1 | 3 | 61 | 65 | 144 | 0 | 0,605 | 0,879 | 4,664 | 6,148 | 0 | 0,004201 | 0,006104 | 0,032389 | 0,042694 |
| VSE FPH | 0 | 1 | 0 | 24 | 25 | 86 | 0 | 0,568 | 0 | 2,994 | 3,562 | 0 | 0,006605 | 0 | 0,034814 | 0,041419 |
| CZU FPE | 1 | 1 | 2 | 10 | 14 | 111 | 1,028 | 0,809 | 0,622 | 1,121 | 3,58 | 0,009261 | 0,007288 | 0,005604 | 0,010099 | 0,032252 |
| TUL HF | 0 | 0 | 0 | 6 | 6 | 36 | 0 | 0 | 0 | 1,041 | 1,041 | 0 | 0 | 0 | 0,028917 | 0,028917 |
| JCU FZ | 0 | 0 | 0 | 4 | 4 | 29 | 0 | 0 | 0 | 0,594 | 0,594 | 0 | 0 | 0 | 0,020483 | 0,020483 |
| SUO OPF | 0 | 0 | 1 | 5 | 6 | 42 | 0 | 0 | 0,293 | 0,236 | 0,529 | 0 | 0 | 0,006976 | 0,005619 | 0,012595 |
| MZU FPE | 0 | 0 | 0 | 3 | 3 | 57 | 0 | 0 | 0 | 0,47 | 0,47 | 0 | 0 | 0 | 0,008246 | 0,008246 |
| UJEP FSE | 0 | 0 | 0 | 3 | 3 | 46 | 0 | 0 | 0 | 0,347 | 0,347 | 0 | 0 | 0 | 0,007543 | 0,007543 |
| ZCU FE | 0 | 0 | 0 | 1 | 1 | 65 | 0 | 0 | 0 | 0,062 | 0,062 | 0 | 0 | 0 | 0,000954 | 0,000954 |
| UP FES | 0 | 0 | 0 | 3 | 3 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTB FME | 0 | 0 | 0 | 3 | 3 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHERS | 5 | 12 | 61 | 377 | 455 | 89 | 5,589 | 8,152 | 19,037 | 47,074 | 79,852 | 0,062798 | 0,091596 | 0,213899 | 0,528921 | 0,897213 |
| Total | 20 | 42 | 110 | 1063 | 1235 | 1230 | 28,221 | 29,451 | 35,827 | 120,024 | 213,523 | 0,022944 | 0,023944 | 0,029128 | 0,09758 | 0,173596 |

Tab 8
Not-weighted lexicographical ranking of institutions (ranking structure {A, B, C, D})

| Ordering | # of publications in groups | | | | Total publications | Faculty | Per capita publications in ranking categories | | | | Per capita total | |
|------------|-----------------------------|----|----|-----|--------------------|---------|---|----------|----------|----------|------------------|----------|
| | A | B | C | D | | | A | B | C | D | | |
| CERGE-EI | | 10 | 16 | 21 | 135 | 182 | 21 | 0,47619 | 0,761905 | 1 | 6,428571 | 8,666667 |
| UK FSV IES | | 3 | 4 | 9 | 140 | 156 | 22 | 0,136364 | 0,181818 | 0,409091 | 6,363636 | 7,090909 |
| VSE FM | | 1 | 2 | 1 | 4 | 8 | 35 | 0,028571 | 0,057143 | 0,028571 | 0,114286 | 0,228571 |
| CZU FPE | | 1 | 1 | 2 | 10 | 14 | 111 | 0,009009 | 0,009009 | 0,018018 | 0,09009 | 0,126126 |
| UHK FIM | | 0 | 1 | 0 | 12 | 13 | 13 | 0 | 0,076923 | 0 | 0,923077 | 1 |
| VSE FNH | | 0 | 2 | 2 | 48 | 52 | 38 | 0 | 0,052632 | 0,052632 | 1,263158 | 1,368421 |
| VSE FIS | | 0 | 2 | 2 | 77 | 81 | 85 | 0 | 0,023529 | 0,023529 | 0,905882 | 0,952941 |
| VSE FPH | | 0 | 1 | 0 | 24 | 25 | 86 | 0 | 0,011628 | 0 | 0,27907 | 0,290698 |
| VSB EF | | 0 | 1 | 3 | 61 | 65 | 144 | 0 | 0,006944 | 0,020833 | 0,423611 | 0,451389 |
| MU EF | | 0 | 0 | 2 | 11 | 13 | 26 | 0 | 0 | 0,076923 | 0,423077 | 0,5 |
| VSE FFU | | 0 | 0 | 4 | 75 | 79 | 78 | 0 | 0 | 0,051282 | 0,961538 | 1,012821 |
| VSE FMV | | 0 | 0 | 2 | 61 | 63 | 78 | 0 | 0 | 0,025641 | 0,782051 | 0,807692 |
| SUO OPF | | 0 | 0 | 1 | 5 | 6 | 42 | 0 | 0 | 0,02381 | 0,119048 | 0,142857 |
| TUL HF | | 0 | 0 | 0 | 6 | 6 | 36 | 0 | 0 | 0 | 0,166667 | 0,166667 |
| UJEP FSE | | 0 | 0 | 0 | 3 | 3 | 29 | 0 | 0 | 0 | 0,103448 | 0,103448 |
| JCU FZ | | 0 | 0 | 0 | 4 | 4 | 46 | 0 | 0 | 0 | 0,086957 | 0,086957 |
| UTB FME | | 0 | 0 | 0 | 3 | 3 | 57 | 0 | 0 | 0 | 0,052632 | 0,052632 |
| UP FES | | 0 | 0 | 0 | 3 | 3 | 65 | 0 | 0 | 0 | 0,046154 | 0,046154 |
| MZU FPE | | 0 | 0 | 0 | 3 | 3 | 75 | 0 | 0 | 0 | 0,04 | 0,04 |
| ZCU FE | | 0 | 0 | 0 | 1 | 1 | 54 | 0 | 0 | 0 | 0,018519 | 0,018519 |
| OTHERS | | 5 | 12 | 61 | 377 | 455 | 89 | 0,05618 | 0,134831 | 0,685393 | 4,235955 | 5,11236 |
| Total | | 20 | 42 | 110 | 1063 | 1235 | 1230 | 0,01626 | 0,034146 | 0,089431 | 0,864228 | 1,004065 |

Table 9
IF weighted lexicographical ranking of institutions (ranking structure {A, B, C, D})

| Ordering | # of publications in groups | | | | Total ubl. | Faculty | Score weighted by IF | | | | Score total A+B+C+D | Per capita score in groups | | | | Total per capita |
|------------|-----------------------------|----|-----|------|---------------|---------|----------------------|--------|--------|---------|------------------------|----------------------------|----------|----------|----------|---------------------|
| | A | B | C. | D | | | A | B | C | D | | A | B | C | D | |
| CERGE-EI | 10 | 16 | 21 | 135 | 182 | 21 | 16,673 | 11,554 | 7,179 | 8,343 | 43,749 | 0,793952 | 0,55019 | 0,341857 | 0,397286 | 2,083286 |
| UK FSV IES | 3 | 4 | 9 | 140 | 156 | 22 | 3,753 | 2,683 | 3,249 | 10,472 | 20,157 | 0,170591 | 0,121955 | 0,147682 | 0,476 | 0,916227 |
| VSE FM | 1 | 2 | 1 | 4 | 8 | 35 | 1,178 | 1,712 | 0,282 | 0,284 | 3,456 | 0,033657 | 0,048914 | 0,008057 | 0,008114 | 0,098743 |
| CZU FPE | 1 | 1 | 2 | 10 | 14 | 111 | 1,028 | 0,809 | 0,622 | 1,121 | 3,58 | 0,009261 | 0,007288 | 0,005604 | 0,010099 | 0,032252 |
| UHK FIM | 0 | 1 | 0 | 12 | 13 | 13 | 0 | 0,69 | 0 | 0,236 | 0,926 | 0 | 0,053077 | 0 | 0,018154 | 0,071231 |
| VSE FNH | 0 | 2 | 2 | 48 | 52 | 38 | 0 | 1,492 | 0,586 | 8,511 | 10,589 | 0 | 0,039263 | 0,015421 | 0,223974 | 0,278658 |
| VSE FIS | 0 | 2 | 2 | 77 | 81 | 85 | 0 | 1,186 | 0,638 | 12,677 | 14,501 | 0 | 0,013953 | 0,007506 | 0,149141 | 0,1706 |
| VSE FPH | 0 | 1 | 0 | 24 | 25 | 86 | 0 | 0,568 | 0 | 2,994 | 3,562 | 0 | 0,006605 | 0 | 0,034814 | 0,041419 |
| VSF EF | 0 | 1 | 3 | 61 | 65 | 144 | 0 | 0,605 | 0,879 | 4,664 | 6,148 | 0 | 0,004201 | 0,006104 | 0,032389 | 0,042694 |
| MU EF | 0 | 0 | 2 | 11 | 13 | 26 | 0 | 0 | 0,746 | 1,523 | 2,269 | 0 | 0 | 0,028692 | 0,058577 | 0,087269 |
| VSE FFU | 0 | 0 | 4 | 75 | 79 | 78 | 0 | 0 | 1,474 | 11,897 | 13,371 | 0 | 0 | 0,018897 | 0,152526 | 0,171423 |
| VSE FMV | 0 | 0 | 2 | 61 | 63 | 78 | 0 | 0 | 0,842 | 7,478 | 8,32 | 0 | 0 | 0,010795 | 0,095872 | 0,106667 |
| SUO OPF | 0 | 0 | 1 | 5 | 6 | 42 | 0 | 0 | 0,293 | 0,236 | 0,529 | 0 | 0 | 0,006976 | 0,005619 | 0,012595 |
| TUL HF | 0 | 0 | 0 | 6 | 6 | 36 | 0 | 0 | 0 | 1,041 | 1,041 | 0 | 0 | 0 | 0,028917 | 0,028917 |
| JCU FZ | 0 | 0 | 0 | 4 | 4 | 29 | 0 | 0 | 0 | 0,594 | 0,594 | 0 | 0 | 0 | 0,020483 | 0,020483 |
| MZU FPE | 0 | 0 | 0 | 3 | 3 | 57 | 0 | 0 | 0 | 0,47 | 0,47 | 0 | 0 | 0 | 0,008246 | 0,008246 |
| UJEP FSE | 0 | 0 | 0 | 3 | 3 | 46 | 0 | 0 | 0 | 0,347 | 0,347 | 0 | 0 | 0 | 0,007543 | 0,007543 |
| ZCU FE | 0 | 0 | 0 | 1 | 1 | 65 | 0 | 0 | 0 | 0,062 | 0,062 | 0 | 0 | 0 | 0,000954 | 0,000954 |
| UP FES | 0 | 0 | 0 | 3 | 3 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTB FME | 0 | 0 | 0 | 3 | 3 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHERS | 5 | 12 | 61 | 377 | 455 | 89 | 5,589 | 8,152 | 19,037 | 47,074 | 79,852 | 0,062798 | 0,091596 | 0,213899 | 0,528921 | 0,897213 |
| Total | 20 | 42 | 110 | 1063 | 1235 | 1230 | 28,221 | 29,451 | 35,827 | 120,024 | 213,523 | 0,022944 | 0,023944 | 0,029128 | 0,09758 | 0,173596 |

We can see that in our case different ranking rules do not exhibit dramatic differences in ordering. In table 10 we provide comparison of different orderings. The results are more sensitive to lexicographic rules, there are more significant cardinal differences (per capita score), but top positions in all orderings are occupied by the same institutions, as well as the bottom positions.

Table 10
Comparison of different ranking rules (orderings)

| Simple not-weighted | Simple weighted | Lexicographic not-weighted | Lexicographic weighted |
|---------------------|-----------------|----------------------------|------------------------|
| CERGE-EI | CERGE-EI | CERGE-EI | CERGE-EI |
| UK FSV IES | UK FSV IES | UK FSV IES | UK FSV IES |
| VSE FNH | VSE FNH | VSE FM | VSE FM |
| VSE FFU | VSE FFU | CZU FPE | CZU FPE |
| UHK FIM | VSE FIS | UHK FIM | UHK FIM |
| VSE FIS | VSE FMV | VSE FNH | VSE FNH |
| VSE FMV | VSE FM | VSE FIS | VSE FIS |
| MU EF | MU EF | VSE FPH | VSE FPH |
| VSB EF | UHK FIM | VSB EF | VSB EF |
| VSE FPH | VSB EF | MU EF | MU EF |
| VSE FM | VSE FPH | VSE FFU | VSE FFU |
| TUL HF | CZU FPE | VSE FMV | VSE FMV |
| SUO OPF | TUL HF | SUO OPF | SUO OPF |
| CZU FPE | JCU FZ | TUL HF | TUL HF |
| UJEP FSE | SUO OPF | UJEP FSE | JCU FZ |
| JCU FZ | MZU FPE | JCU FZ | MZU FPE |
| UTB FME | UJEP FSE | UTB FME | UJEP FSE |
| UP FES | ZCU FE | UP FES | ZCU FE |
| MZU FPE | UP FES | MZU FPE | UP FES |
| ZCU FE | UTB FME | ZCU FE | UTB FME |

6. Concluding remarks

The paper, of course, has no ambition to present all possible ranking rules. For example, recently used ranking methodology of Council of Government of the Czech Republic for Research and Development is using its own scheme of publication outputs evaluation with respect to research funding (Cahlík and Pessrová, 2005). Publications are classified into 10 groups (ranking categories) and each group has its weigh (see Table 11).

Table 11

| Ranking category | weight w_i |
|---|---------------------------|
| R1 papers in impacted journals non Czech or Slovak | $4 + (10*IF)/(median IF)$ |
| R2 papers in impacted journals in Czech or Slovak | $1 + (10*IF)/(median IF)$ |
| R3 papers in refereed not impacted journals non Czech or Slovak | 4 |
| R4 papers in refereed not impacted journals Czech or Slovak | 1 |
| R5 scientific book non Czech or Slovak | 20 |
| R6 scientific book Czech or Slovak | 5 |
| R7 chapter in scientific book non Czech | 6 |
| R8 chapter in scientific book Czech or Slovak | 1 |
| R9 chapter in proceedings non Czech or Slovak | 4 |
| R10 chapter in proceedings Czech or Slovak | 1 |

Weighted score is defined as

$$r_i = \frac{\sum_{k=1}^{10} w_k t_{ik}}{r_i}$$

where w_k is the weight of one publication in category k , t_{is} is the number of publications of institution i in category k , r_i is the government budget subsidy spent in institution i for research projects in particular period. Quality in this ranking is introduced by weights. One understands that any recognized ranking rule is result of a difficult compromise of different professional groups representing different disciplines and institutions, where group interests and habits are involved. Median normalization makes possible to compare different research disciplines with different scales of impact factors. But the constants in particular weights are rather arbitrary and shifted in favor of books that are not considered by international standards to be a part of research production, but rather a compilation or synthesis of research results published in recognized journals. Another weak point of this method is source of data: local RIV database is updated by authors themselves and de facto the only criterion for inclusion into the database is existence of ISSN or ISBN of publication media. Clear definition of refereed journals is missing and in the case of books peer review process is perhaps implicitly assumed, but not explicitly required. Except of that, parameters are changing from year to year, and domestic budget subsidies are a bad proxy for financing research (e.g. international grants and private sector subsidies are not considered).

While in declarative dimension nobody questions the quality factor is to be included in any type of evaluation, there is no consensus in quality indicators. As a proxy for quality of publication (or research result) is usually used impact factor of journal of publication. The

reason for that is first of all the serious peer reviewing process as a necessary condition for a journal to be included into the list of considered journal, and objectively evaluated influence of the journal measured by relative number of citations of its publications by other journals.

On the other hand there exist legitimate objections to impact factor as an indicator of quality of a particular publication (see e.g. Garfield, 2005, Špála 2006). Impact factors undoubtedly indicate the quality (or scientific influence) of the journals, but only indirectly the quality of publication (they rather say something about the ability of the author to get the paper into a good journal). On the other hand, frequently used argument is about “national dimension” of some sciences with research results being of interest only for narrow domestic scientific community and having no space on international academic market (usually social sciences and humanities are active in this argumentation). Then the questions are: Include into evaluation publications in not impacted journals, and if yes, with what weights? Include into evaluation books and chapters in books that are not participating in impacting process at all, and if yes, with what weights?

One way how to solve this dilemma is e.g. to use the similar evaluation process for publications as for the journals, i.e. to measure scientific influence or impact of a publication independently of where it appeared by number of its citations in impacted journals. Let c_{ij} be the number of citations of a paper i by journal j (from the list of impacted journals) and f_j be impact factor of j . Then the weight (impact factor) of publication i could be defined as

$$w_i = \sum_{j \in J} c_{ij} f_j$$

where J is the set of impacted media.

In the same directions goes Hirsch (2005) proposal of so called H-index. An individual has a research performance index H if h of his/her n papers have at least h citations each and the other $n-h$ papers have at most h citations each. First empirical analyses of H-index characteristics of the Czech economists were presented by Cahlík and Pessrová (2006) and Macháček and Kolcunová (2006). There are more ways how to extend the H-index concept for evaluation of institutions. The most straightforward one is to define H-index of an institution as the number h of publications of the institution members having at least h citations each when other publications have at most h citations each.

Both of these approaches (impact factor of publication and H-index) bring into the evaluation game good quality not impacted publications. However, the price of that is very high complexity of data processing.

Another possibility is a compromise between simple not-weighted rule and simple weighted rule with weight of publication i in media j

$$w_{ij} = \alpha + (1 - \alpha)f_j$$

where α is a weight of record (presence in database) and $(1 - \alpha)$ is the weight of quality of media of publication measured by impact factor, $0 \leq \alpha \leq 1$, providing that used database records not only impacted journals, but also not-impacted media (as it is in EconLit or Google Scholar). This system was used in original research reported in this paper (Turnovec, 2005) with $\alpha=0,5$, but another choice of α is possible (e.g. minimal impact factor of journals from J).

Research of ranking rules should continue to provide some general axioms that might bring more objectivity into discussions on “what ranking rules are the right ones”. It is always easier to agree on general principles than on some ad hoc counts. Palacios-Huerta and Vold (2004) presented useful ideas and definitions that can bring more light into this controversial dispute.

Rankings have strong motivation effects, providing signals for individuals and institutions, cultivating publications habits and setting up good guidelines for PhD students. It is important to reach consensus about selected ranking rules, perhaps on the basis of Professional societies (such as Czech Economic Society), grant agencies etc. Any systematically used ranking rule is better than nothing.

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