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Assessing publications through a bibliometric indicator: The case of comprehensive evaluation of scientific units in Poland

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Abstract

The Polish performance-based research funding system, which is called the Comprehensive Evaluation of Scientific Units, is very complex. It comprises several aspects: the publication counting system, the Polish journal ranking, and translating the assessment criteria into the point system. The Polish model applies to all types of research institutions, which are evaluated through the same criteria. However, the weights of criteria are differentiated in relation to various groups of sciences. In the last cycle of evaluation, almost 185,000 publications were submitted for evaluation by the Polish scientific units in the period of 2009–12. The present article describes the main components of the system and shows how the system has been implemented. Subsequently, the effects and policies of assessing publications are discussed. Using the points is considered with respect to three issues: (1) the consequences of whole counting publications, (2) the underestimation of writing in Polish, and (3) the local use of the points for evaluating an individual researcher. The article concludes with a discussion of the Polish model from an international perspective.

Key words: bibliometric indicator; Comprehensive Evaluation of Scientific Units; Eastern Europe; performance-based research funding system; Poland; science policy.

1. Introduction

Several European countries have developed research evaluation models in the past two decades. These models, being based on *ex post* evaluation, are an important part of performance-based research funding systems (PRFSs). There are two main ways of constructing such national systems: (1) using the peer review by disciplinary panels (e.g. the U.K.'s Research Excellence Framework, in which only selected outputs are evaluated) and (2) using the bibliometric indicator (publication or citation based) to measure the outputs of the whole academic community (e.g. in the Czech Republic, Denmark, Finland, Belgium/Flanders, Norway, and Poland).

The Comprehensive Evaluation of Scientific Units (CESU) is the Polish PRFS. Similarly to other Eastern European countries, Poland has a different system for funding and research evaluation than Western and Northern European countries. In 1986, the United Kingdom implemented the first PRFS, i.e. the Research Assessment Exercise, which later transformed itself into the Research Excellence

Framework. It was only after the Iron Curtain fell that Poland became one of the first countries to develop a peer-review-based research evaluation system in 1991. This implementation was not possible in a centrally planned approach to science because the PRFS, which is based on an *ex post* evaluation, requires trust and confidence in scientific units as well as autonomy of research (Jabłecka and Lepori 2009). Under central planning, the government set the main aim for research institutions which had to educate personnel for industry and the army (Dobrov, 1968). The decisions as to which fields of sciences should get the funding were made high on the political level, i.e. they did not depend on any evaluation of the performance.

The present article aims to describe the CESU in Poland and to examine various problems of assessing publications through the point system within the Polish research evaluation model. The criteria of evaluation have brought many discussions, controversies, and even public demonstrations. This criticism is due to the fact that one and the same system is used for all groups of sciences, which makes
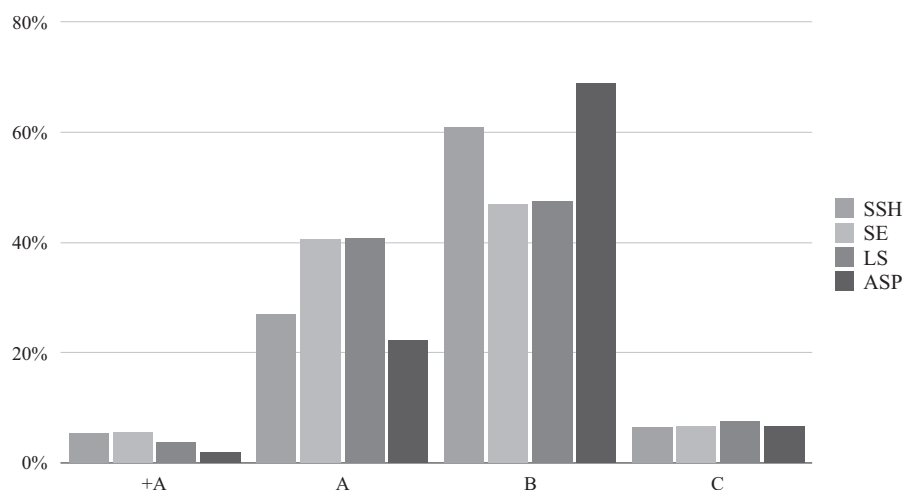
Figure 1. Results of the 2013 CESU: assigned categories of scientific units (A+, A, B, C) in each group of sciences: (1) the SSH, (2) the SE, (3) the LS, and (4) the ASP.

it very difficult to keep the balance between 'soft sciences' and 'hard sciences'. I will analyse three problems of the publication assessment in Poland: (1) the publication counting, (2) the devaluation of writing in Polish, and (3) the local use of bibliometric indicators for evaluating an individual researcher. In this context, the present article takes a new look at the research evaluation in Poland and shows the effects that occur when evaluation is almost entirely metrics based.

PRFSs have gained importance in recent years, and their development is an important subject of study (Hicks 2012; Aagaard, Bloch and Schneider 2015; Good et al. 2015). However, these analyses paid little attention to the region of Central and Eastern Europe (Good et al. 2015). While there are several studies mentioning the Polish system, they all present the key mechanism of evaluation in an incomplete way. For instance, Aagaard et al. (2015 p. 106) write that the Polish PRFS is a kind of citation-based model like the Finnish, Danish, or Norwegian models. The main problem with analyses of the Polish model may result from the insufficient studies and the complex character of this PRFS. Thus, the present article brings an overview of the main solutions of the CESU in Poland.

The purpose of the current Polish system is to distribute research funding among institutions in the higher education sector. Initiated in 1991 by the State Committee for Scientific Research, the Polish system has evolved from a peer-review-based model to a metrics-based one in several cycles (1998–9, 2001, 2005, 2010). The last CESU was realized in 2013, and the outcomes of scientific units from 2009 to 2012 were evaluated.

The article is structured as follows: in Section 2, the framework of the CESU in Poland is presented. In Section 3, the publication assessment within the CESU is described. In Section 4, the three main problems of assessing publications are discussed. In Section 5, the evaluation of the CESU is analysed in a broader international context. Finally, in Section 6, a summary is provided, and the problems and the impact of the CESU are discussed.

2. The framework of the comprehensive evaluation of scientific units

The CESU is used for all types of research institutions, similarly to the Czech and Norwegian models. This includes four groups of research institutions: higher education institutions, independent research institutes, the Polish Academy of Sciences, and the Polish Academy of Learning, which is similar to an academy of sciences. The unit of analysis is called 'the scientific unit' and is understood as a higher education institution, a unit within higher education institution (e.g. a faculty), a research institute, or an institute of the Polish Academy of Sciences.

2.1. Background and organization

The Ministry of Science and Higher Education established the two advisory groups that have been responsible for the principles of the 2013 CESU and next cycles. The first group is the Committee for Evaluation of Scientific Units,[1] which proposes new criteria of evaluation for all scientific units.[2] The other advisory group is the Specialist Team for the Evaluation of Scientific Journals,[3] which proposes regulations for assessing articles that are published in various journals.

As Table 1 shows, each scientific unit was evaluated in accord with the four criteria: *C1*—scientific and creative achievements, *C2*—scientific potential, *C3*—material effects of the scientific activity, and *C4*—other effects of the scientific activity. Each criterion contains various parameters for all groups of sciences. The parameters define what elements of the scientific unit's output can be evaluated, e.g. in the C1: 'monographs', 'articles', and 'patents' or in the C2: 'the qualifications of academic degrees' or 'the status of National Research Institute'. For each evaluated element, the given scientific unit obtains a specified number of the points. In this way, the research output is translated into 'the points'. However, the points do not correspond in any way to the Polish Zloty (PLN), as it takes place in the Czech system, in which the points represent the Czech crowns (Good et al. 2015: 92). The points obtained by a scientific unit serve to build the ranking of institutions and to assign the scientific categories. The amount of allocation depends on the assigned scientific categories among others and not on the number of obtained points in the CESU.

In the 2013 CESU, approximately 200 persons were involved: 30 members of the Committee for Evaluation of Scientific Units, 160 members of the Evaluation Teams who check the data quality submitted by the scientific units, and several ministerial officials.

Moreover, there were two technical operators of the evaluation: the National Information Processing Institute and the Index Copernicus International. In this way, in the last CESU, the outcomes of over 80,000 scientists were evaluated. The total cost of conducting the 2013 CESU amounted approximately to 3 million PLN (Zabel 2013). While the costs may seem very small in comparison to Western countries, it was very important for the Polish state to keep the funding distribution as inexpensive as possible, given the limitations of the national budget.

In the 2013 CESU, 963 scientific units were evaluated in four groups of sciences: (1) the social sciences and humanities (SSH) group, (2) the sciences and engineering (SE) group, (3) the life sciences (LS) group, and (4) the art sciences and artistic production (ASP) group. The CESU has tried to account for various publishing patterns and the differences between disciplines through setting different parameters and weighting the total sum of points obtained by a scientific unit in the given criteria according to the different groups of sciences. Establishing the optimal measurement formula is perceived by Polish scholars as one of the important challenges of this system.

The effects of the 2013 CESU were first presented in September 2013 and—after the appeals—definitively in July 2014. The main result of the CESU is the categorization of scientific units into categories in terms of their originality and scientific significance: A+ (leading units), A (very good units), B (sufficient units), and C (insufficient units). While the A+ units have been selected from the best of the A units, the final regulations for this process have never been published.

As Table 2 shows, the Polish model is publication based, which generates a more transparent evaluation, and it yields lower implementation costs than the peer-review-based models. Also, the CESU result may show the productivity level and link it with the funding level. However, besides the advantages, there are also certain drawbacks of the CESU, such as ignoring the publishing patterns and discouraging innovative research. This shows that it is impossible to fully assess the costs and benefits of the PRFSs (Hicks 2012: 256).

Most of the evaluated scientific units were units within universities (78.5%). Moreover, other units were also evaluated: 70 units of the Polish Academy of Sciences, 115 research institutes, and 22 other units.[4] Finally, 45 of 963 scientific units were categorized as leading units (A+). The others were divided into categories: A, B, C (Figure 1). Despite using the same criteria for every group of scientific units, a balance between a qualitative and quantitative evaluation is a virtual one: the domination of the bibliometric indicators favours 'hard sciences' (the LS and the SE groups) rather than 'soft sciences' (the SSH and the ASP groups). In the LS and the SE groups, there are more scientific units which received the A category than in the SSH and the ASP groups. The A+ category was assigned to a similar number of units in all groups of sciences. However, the favouring of 'hard sciences' should be analysed in the light of the total number of the A and A+ categories because the A+ units were selected from the A units.

2.2. Funding

The financial consequences of the CESU are related to the so-called statutory funding that is annually distributed to the scientific units. However, the evaluation is conducted every 4 years. Therefore, the attributed categories are permanent till the next CESU. In 2014, the statutory funding for all scientific units amounted to 2.2 billion PLN and constituted 31.38% of the entire budget for science in Poland. The rest of the national budget (68.62%) was allocated to the National Science Centre, the National Research Centre for Research and Development, and other areas. The scientific unit funding was based to some extent on the educational unit size (Ministerstwo Nauki i Szkolnictwa Wyższego 2015: 10).

In the process of distributing the statutory funding, the attributed categories of scientific units play a major role. The amount of funding for a scientific unit is calculated on the basis of two factors: (1) the amount of funding which a scientific unit obtained in the previous year and (2) the algorithm that includes the number of employees, the attributed scientific category in the CESU, the type of higher education institution, and the cost-effectiveness of research depending on the field of research. In the beginning of 2015, the first factor was removed from the Polish system. Thus, the attributed categories in the CESU now play an even greater role in distributing the statutory funding. The importance of the category results from the values in the algorithm are set annually. In 2015, the values amounted to the following: for the A+ units, 1.5; for the A units, 1.0; the B units, 0.7; and the C units, 0.4.

2.3. Weight of criteria and the evaluation phases

The Committee for Evaluation of Scientific Unit differentiates the weighs of criteria to account for the different types of research institutions and to keep a balance between the groups of sciences. Therefore, the significance of the criteria is not equal.

As Table 3 shows, the most important criterion is the C1, whose weighted value—depending on the group of sciences—oscillates between 35 and 75 of the final assessment: the sum of weights of the four criteria is 100. In this criterion, the highest number of points is assigned for articles indexed in the Web of Science (WoS). However, the coverage degree for the SSH publications in the WoS is low, especially in the humanities in languages other than English (Sivertsen and Larsen, 2012). It is noteworthy that the basis of differentiation was reached through an independent decision of the committee, and the scholarly community was not consulted.

The Polish model is primarily based on formal and bibliometric criteria. The peer review is fully implemented only within Criterion 4, and at the same time, the results of this criterion were most often questioned in the appeals (Skoczeń et al. 2014). Using peer review within the CESU faces many problems stemming from both historical and objective circumstances. The historical circumstances are connected with the social and political transformations after the breakdown of the Communist regime and the lack of trust in the experts (Jabłecka and Lepori 2009). The same situation can be observed in the Czech Republic, where using the indicators instead of the peer review is driven by 'a desire to depoliticize and depersonalize the evaluation and funding process' (Good et al. 2015: 102). The latter circumstances are combined with engaging scientists only from the Polish scientific units in the operation of the CESU. In Poland, in many disciplines, the academic research community is too small to apply good practices and solutions in the peer-review system (Jabłecka 1997; Łomnicki 1997).

The evaluation within the 2013 CESU consists of three phases[5]:

1. *Classification*—scientific units are assigned to the Joint Evaluation Groups within a particular group of sciences (e.g. a faculty of philosophy is compared with the other faculties of philosophy).

Table 1. The criteria of evaluation within the 2013 CESU

Criterion name	Main parameters in the criteria for each group of science			
	SSH	SE	LS	ASP
Scientific and creative achievements (C1)	• Journal articles • Monographs • Patents	• Journal articles • Monographs • Patents	• Journal articles • Monographs • Patents	• Journal articles • Monographs • Patents • Artistic production
Scientific potential (C2)	• Qualifications of academic degrees • Promotions • Employees' positions in scientific organizations	• Qualifications of academic degrees • Promotions • Employees' positions in scientific organizations • Projects • Accredited laboratories • Status of National Research Institute	• Qualifications of academic degrees • Promotions • Employees' positions in scientific organizations • Accredited laboratories • Status of National Research Institute	• Qualifications of academic degrees • Promotions • Employees' positions in scientific organizations
Material effects of the scientific activity (C3)	• Expert opinions • Projects	• Expert opinions • Salaries from external funds • Equipment and software expenses • Commercialization of technology	• Salaries from external funds • Equipment and software expenses • Commercialization of technology	• Expert opinions • Artistic activities • Projects • Commercialization of artistic production and technology
Other effects of the scientific activity (C4)	• Prizes • Conferences • Popularization of Science • Other	• Prizes • Conferences • Popularization of Science • Other	• Prizes • Conferences • Popularization of Science • Other	• Prizes • Conferences • Popularization of Science • Other

Table 2. Advantages and drawbacks of the Polish PRFS, i.e. the CESU

Advantages	Drawbacks
• There is one system for all types of research institutions. • The system provides a mechanism for keeping the balance between different disciplines and groups of sciences (the weight of criteria). • We have a meritocratic solution, which means that the allocation is based on the scientific units' performance. • The Polish model is publication based, which generates a more transparent evaluation and which is more reliable than evaluation based on the peer review (lack of trust in the experts). • The units of analysis may be heterogeneous because all types of research institutions are evaluated. • The system may improve the individuals' as well as scientific units' performances. • The system encourages building explicit research strategies of scientific units. • It yields lower implementation costs than the peer-review-based models. • The result may show the productivity level and link it with the funding level. • The system makes it possible to gather information about the performance and the activities of scientific units on the national level.	• The system differentiates the channels of scholarly communication and thus ignores the publishing patterns and the differences between the various disciplines. • It favours publications in the so-called congress languages, which means that evaluating publications in the humanities (where the majority of works is written in Polish) becomes questionable. • The publication-based model may lead to the diminishment of outstanding contribution value so that many articles in lower impact factor journals may become more valuable than one paper in a very prestigious journal. • The system brings results in a lack of a proper database that would cover all publications especially in the SSH (the data quality should guarantee an accurate and reliable evaluation). • The system may discourage innovative research and encourage publishing many articles with the same findings (e.g. 'salami publishing'). • It may discourage conducting long-term research. • There is no correlation between the teaching and the research, which brings about lower priority of teaching. • The rules of evaluating scientific units are translated to the rules of evaluating individual researchers. • The mechanical system based on the number of publications may cause developing strategies of 'dealing' with the system.

Table 3. The weight of criteria in each group of science and a type of scientific unit

Criterion	Criterion weight		
	Research unit within the higher education institution	Research units of the Polish Academy of Sciences and international research institutes	Research institutes and other
Group of the SSH			
Scientific and creative achievements (C1)	65	65	65
Scientific potential (C2)	15	15	15
Material effects of the scientific activity (C3)	5	5	5
Other effects of the scientific activity (C4)	15	15	15
Group of the SE			
Scientific and creative achievements (C1)	65	65	35
Scientific potential (C2)	10	10	10
Material effects of the scientific activity (C3)	15	15	45
Other effects of the scientific activity (C4)	10	10	10
Group of the LS			
Scientific and creative achievements (C1)	70	75	60
Scientific potential (C2)	5	5	5
Material effects of the scientific activity (C3)	15	10	25
Other effects of the scientific activity (C4)	10	10	10
Group of the ASP			
Scientific and creative achievements (C1)	60	60	60
Scientific potential (C2)	20	20	20
Material effects of the scientific activity (C3)	5	5	5
Other effects of the scientific activity (C4)	15	15	15

Table 4. Points per publication within the 2013 CESU

Journal articles	Points per publication
Article in journal from the A list (journals with impact factor)	from 10 to 50
Article in journal from the B list	from 1 to 10
Article in journal from the C list (the ERIH lists)	from 10 to 14
Article in a congress language[a] (other non-national journals)	4
Article in a conference proceeding that is indexed in the WoS[b]	15
Monographs	Points per article
Monograph in Polish	20
Monograph in a congress language[a]	25
Chapter in Polish	4
Chapter in a congress language[a]	5
Edited volume in Polish (points for editing)	4
Edited volume in a congress language[a] (points for editing)	5

[a]Congress languages: English, German, French, Spanish, Russian, Italian, or a fundamental language for a discipline, e.g. Czech for Czech philology.
[b]Only for the SE group and for the LS group.

2. *Parameterization*—the outcomes of the scientific units are evaluated through four criteria (C1–C4). Each unit is mutually compared with other units within the Joint Evaluation Group.
3. *Categorization*—the final rank of scientific units is made by the pairwise comparisons method.

Although the outcomes are weighted and there are different parameters in the criteria, an important problem still exists with assessing the publications in the SSH. This situation results from two issues: (1) the field-specific-publications patterns, with fewer co-authorship publications than in other groups of sciences and a different citation culture (Van Leeuwen, 2006), and (2) the coverage of the SSH publication in the WoS that is used in the Polish parameterization. Both issues are related to the *points*, i.e. the bibliometric

indicator which has been used within the CESU. The following section discusses assessing publications and using the points to weight outcomes.

3. Assessing publications within the comprehensive evaluation of scientific units

The assessment of publications is an important part of the second phase of evaluation, i.e. parameterization. According to Luukkonen, this procedure should be called 'outcome measurement' rather than 'evaluation' because it 'refers to the use of quantitative measures in evaluation and to *ex post* evaluation' (Luukkonen 2002: 81).
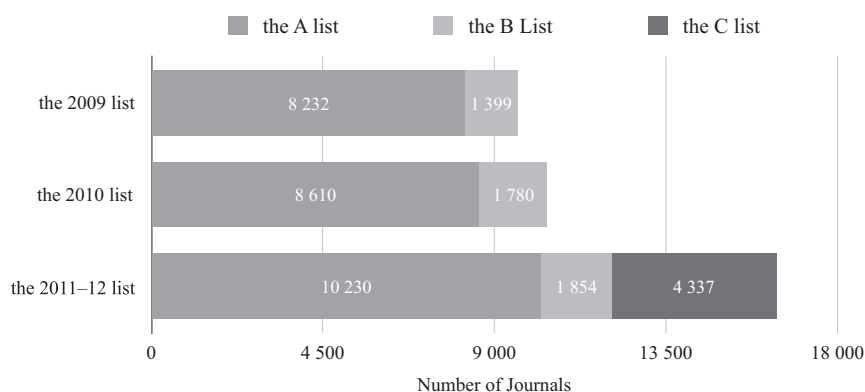
Figure 2. Structure of the three lists of journals used in the 2013 CESU.

There are two crucial assumptions of the publications measurement in the CESU. The first assumption is connected with the limit of publications that a scientific unit can submit for evaluation. This limit is expressed in the formula $3N - 2N_0$, where N is the arithmetic mean of the number of academic staff members who work in a scientific unit during the evaluated period (2009–12), while N_0 is the number of academic staff members who were not authors of any publication during the evaluated period. This means that if in a scientific unit, there were 100 scientists and 90 of them were authors of at least one publication, then this scientific unit could submit 280 publications for evaluation within the 2013 CESU. The second assumption of the publication measurement is related to the limited number of monographs that a scientific unit can submit for the evaluation. For instance, in the group of the SSH, the limit of submitted monographs is 40% of all submitted publications. This means that in the above-mentioned example, a scientific unit can submit 280 publications, of which there can be 112 monographs. The effect of this limit is the necessity of publishing more journal articles (even in the humanities) than book chapters and monographs.

As Table 4 shows, in Criterion 1, there are two main parameters related to publications: (1) publications in scientific journals and (2) monographs (including chapters). Every publication can be acknowledged as an output of the scientific unit, when the author attributes this publication to a particular unit and when the publication meets some formal conditions.

In Poland, there is no single main data source in which the information about scientific publications is gathered. In the process of the 2013 CESU, all scientific units had to submit the *Ankieta jednostki naukowej* [The Questionnaire of Scientific Unit] through the *POL-on—Information System on Higher Education*. The list of the scientific unit's publications was a part of this form. However, this list is currently not accessible for everyone. The whole data collection was built only for the CESU's purposes and used only by the Ministry of Science and Higher Education.

3.1 Articles in scientific journals
The publications in scientific journals within the 2013 CESU were assessed according to the List of Journals (the so-called 'ministerial list', i.e. the Polish journal ranking), prepared annually by the Specialist Team for the Evaluation of Scientific Journals. The number of journals included in the ministerial lists was increased, and the last list in the 2013 CESU contained 16,421 journals (Figure 2). The structure of the ministerial list has been widely discussed in Poland.

The articles published in 2009 and 2010 were assessed in accord with the 2009 list and the 2010 list, respectively. Each of these lists consists of two parts: (A) journals indexed in the Journal Citations Reports (JCR) and (B) Polish or foreign journals without the impact factor. In 2011, the new regulations for the ministerial list were presented. Two major changes were made: (1) the European Reference Index for the Humanities (ERIH) was added as a source for the list of journals, and (2) formal conditions for Polish or foreign journals without the IF were presented e.g. a number of international contributors, the definition of scientific article, a number of articles published per year. These conditions applied only for journals that are not indexed in the JCR or the ERIH. Thus, the articles published from 2011 to 2012 were evaluated according to the 2011–12 list that consists of three parts: the A list includes journals indexed in the JCR; the B list includes Polish or foreign journals without the impact factor; and the C list includes journals indexed in the ERIH. The 2011–12 list is perceived as fundamental for the 2013 CESU, and many scientists identify this list with principles for the output measurement for the whole period of evaluation in Poland.

The number of points assigned to a journal indexed on the 2011–12 list depends on the following:

- The A list—the rank-normalized 5-year impact factor that is translated into the number of points (from 15 to 50). This number depends on the 5-year impact factor values in the JCR subject category. The normalization is provided separately for each subject category in the JCR (e.g. 'Communication' or 'Acoustics'). Therefore, two journals with different numbers for their impact factor can be assigned the same number of points.
- The B list—there are 13 criteria: 12 formal (i.e. the number of authors from foreign institutions, the number of reviewers and authors from foreign institutions, and the number of articles per year) and one bibliometric (the *predicted impact factor*). The number of points (from 1 to 10) depends on how many criteria are fulfilled. There are specific regulations for each criterion; e.g. the journal can obtain some points if it publishes at least 24 articles per year.
- The C list—the number of points depends on the category of the ERIH's list in which the journal is indexed. These could be the National category (10 points), International 2 category (12 points), and International 1 category (14 points).

Although the parameterization is based on an assumption of the comparable measurement, there is still a big problem with assessing publications. The Polish model makes it possible to compare

publications from different research areas. However, there is no single comprehensive data source for all publications, especially in the SSH. In light of the problem with a coverage degree of the SSH in the WoS, the B list is crucial for Polish scholars and scientific units (on the remaining parts of the list, less than 300 Polish journals are indexed).

3.2 Monographs and chapters

Monographs within the 2013 CESU were defined as academic books (excluding handbooks and textbooks), including lexicons, critical editions, encyclopaedias, and conference proceedings. Moreover, a monograph has to fulfil the following conditions: (1) it has to be reviewed and it has to present an original research problem, (2) it has to contain a bibliography, and (3) its length should be at least six author sheets (240,000 characters or approximately 36,000 words). If these conditions are fulfilled, then the author's scientific unit can get—depending on the language of the publication—20 or 25 points (Table 4). When the monograph is an edited volume, then it brings 4 or 5 points for the editing and 4 or 5 points for the chapter (the length of chapter should be at least a half an author sheet—20,000 characters or approximately 3,000 words). In such a situation, however, the sum of points cannot exceed the maximum number of points for one monograph (20 or 25).

Scientific journals are a fundamental form of knowledge dissemination for many disciplines. Despite this, monographs play a major role in the fields of the humanities (Zuccala et al. 2014). One can say that a monograph is more important than an article, e.g. in philosophy. However, it depends not only on the discipline, but it is also connected with the complexity of the research problem and many other factors. Nevertheless, in the CESU, there is a very strong (implicit) assumption that in contemporary science, journals are the main channel of scholarly communication for each discipline. In effect, even the most prestigious monograph (25 points) has to be assessed at a lower level than the most prestigious article (50 points). Therefore, scholars from the SSH ask if such regulations are justified for every group of science. The supporters of this solution argue that it is impossible to estimate monographs higher without constructing an additional list of publishers.

4. Three problems with the publication assessment in Poland

The Polish model, similarly to the Norwegian one, encourages scientific units and their researchers to publish through the most 'prestigious' publication channels (Schneider, 2009). Applying one simple bibliometric indicator is difficult and controversial. There are different collaboration and citation patterns in different groups of science. Constructing a balance in the evaluation between all these factors is extraordinarily problematic. Although there is only one indicator, a multiplicity of the channels of scholarly communication and publication patterns brings about many ambiguous situations. Therefore, the present section shows the consequences of using the *points* in the publications assessment.

4.1 Counting publications

The publication points are assigned according to two characteristics: (1) the type of publication, i.e. article, book, etc., and (2) the number of co-authors that work in the same scientific unit.

Publications are attributed to a scientific unit according to the author's affiliation. If the author is affiliated with two or more units, then they have to declare to which scientific unit their publications are affiliated. A publication can be attributed only to one scientific unit. Thus, if an author publishes an article in a journal indexed in the A list (e.g. 30 points), then the author's scientific unit collects 30 points. This issue becomes more complicated when authors are from various units.

The Polish model combines two approaches to use the whole counts at the level of scientific units, including the counting used in e.g. the Norwegian model, with the whole counting used in e.g. the Flanders and Swedish models:

1. *Publications are not counted two or more times in one scientific unit* (as in the Norwegian model): if all authors work in the same scientific unit, then the points are distributed 'between' the authors. If, for instance, five different authors from Unit 1 published an article in a journal (30 points), then their scientific unit collects 30 points.
2. *Whole counting* (gives the same result as in Flanders and Sweden, but different from Norway, where fractionalized counts appear if more than one institution has contributed to the publication): if the authors work in different scientific units, then the points are whole counted (all units receive full points for the publication). If, for instance, five different authors (Unit 1: two authors, Unit 2: two authors, Unit 3: one author) published an article in a journal (30 points), then their scientific unit collects full points for the publication: Unit 1: 30 points, Unit 2: 30 points, and Unit 3: 30 points. This means that one publication 'generates' 90 points in the process of the CESU.

Therefore, the publications assessment of the CESU favours co-authorship of publications; however, only if the co-authored papers are written by researchers from different Polish scientific units (according to 'the logic of collecting the points').

To implement such solutions, the Committee for Evaluation of Scientific Units has developed a unit of measurement called the *evaluated item*. The evaluated item is a single element of the scientific unit's output, e.g. a monograph, patent, chapter, article, patent, organized conference, and an artistic outcome. Thus, the data related to the CESU do not always present the actual number of Polish researchers' publications, but a number of *evaluated items* that were generated during the evaluation. Thus, one publication can generate 1, 3, or 10 evaluated items. By way of illustration, an article published in 2010 was submitted 12 times to the CESU and generated 480 points. Naturally, this is not an isolated case. For instance, a Polish journal indexed on the A list published 487 articles with at least one Polish affiliation in 2009–12. However, in the CESU, 1,533 evaluated items were generated. This means that every article from the journal in question was connected with at least three evaluated items (Kulczycki, Drabek and Rozkosz 2015).

In Criterion 1, within all groups of sciences in the 2013 CESU, almost half a million[6] evaluated items were taken into account. These evaluated items were generated by 184,456 publications.[7] The submitted monographs were written in at least one of 35 languages (English, German, and Esperanto, among others). Most of the monographs were in Polish (17,150) and English (1,859). Submitted chapters (or—more accurately—evaluated items connected with chapters) were written in at least one of 40 languages: most often in Polish (112,083) and English (25,760). There were

304,021 evaluated items connected with articles in all groups of sciences. From 2009 to 2012, Polish scientists published in 7,826 journals indexed in the ministerial list. Ten of the journals with the highest number of assigned evaluated items are published in Poland: two of these are indexed in the A list and eight are indexed in the B list.

Mixing the two approaches to points counting brings about important problems. Scholars who work in complex research groups (especially within international collaboration) are privileged: it is easier to be one of the authors of an article than to be the only author of a publication. In such an approach, we do not measure the author's contribution. However, there is no simple answer to this problem. The counting system can motivate scholars to collaborate across research institutions from Poland and other countries. However, sometimes it is an artificial collaboration initiated only for the purpose of dealing with the evaluation system (Kulczycki, Drabek and Rozkosz 2015). On the other hand, fractional counting diminishes the encouragement to collaborate. For instance, an article written by several authors from different scientific units and published in a top-ranked journal could bring less points to a scientific unit than an article written by one author and published in a local journal. This shows that both approaches to points counting can have an impact on the publishing patterns.

4.2 Writing in Polish

The Polish system creates a large incentive for publishing in one of the so-called congress languages[8] rather than in Polish. Other national systems also favour international publishing. For instance, Aagaard et al. (2015) show that the indicator used in the Norwegian model strongly privileges international publishing over the Norwegian language publication channels.

According to the CESU regulations, monographs and chapters bring more points when they are written in English than in Polish, and it does not depend on the publisher's rank or the place of publication. This problem is more important when we investigate assessing articles in journals. In Poland, according to the 2011–12 list, over 1,200 Polish journals[9] have been published in the field of the SSH—over 1,000 of these journals are indexed in the B list. However, only nine of all Polish journals from the SSH are indexed in the Social Sciences Citation Index, and only some of them publish articles in Polish. This means that there are only a few journals that are on the A list and—potentially—can get 50 points per article. In practice, the most highly assessed Polish journal in the SSH is the *Problemy Ekorozwoju* (20 points). In other groups of sciences, there are many journals in which scientists can publish their research in *lingua franca* of their disciplines, i.e. English, and receive more than 20 points. However, publishing in the SSH (especially in the humanities) is very often related to investigations conducted in the researcher's native language. For instance, most readers of publications devoted to the development of Polish vocabulary and grammar would want to read the publication in question in Polish. Therefore, humanists often claim that publishing in Polish is the best way not only to disseminate knowledge but also to reproduce national culture and heritage.

Scholars argue that underestimating publications in Polish is causing damage for research in the humanities. Moreover, an article can yield the highest number of points when the journal is indexed in the A list which is built on the JCR. This means that no journal from the humanities can be included in the A list because Thomson

Reuters, which constructs the JCR, has another list for such journals, called the Arts & Humanities Citation Index. There are some interdisciplinary journals in the JCR. However, as a rule, the humanities journals are not indexed in the JCR. One can say that all scholars from the humanities are evaluated in the same way, and it is not a problem. Notwithstanding this, the humanists are evaluated together with the social scientists that have the Social Sciences Citation Index, in which the social sciences journals have an impact factor. In consequence, scholars who work in the same scientific unit from the SSH can receive different number of points for articles in the top-ranked journals in their fields. The problem had to be resolved through the implementation of the ERIH list as a part of the ministerial list. The ERIH list was supposed to appreciate other international journals published in European languages. However, the implementation of the ERIH list showed that Polish humanists published mainly in national journals in Polish. While 75.18% of the evaluated items connected with the C list were published in Polish journals that have a national range, 24.12% of these items came from 10 Polish journals (Kulczycki, Rozkosz and Drabek 2015).

Polish journals, which are most highly indexed in the B list, are also evaluated through their internationalization. For instance, the number of non-national scientists on editorial boards, the number of the reviewers from outside of Poland, and the number of articles written in congress languages have an important impact on the final assessment of the journal. Moreover, a new definition of a scientific article has been developed for the journals from the B list. This definition excludes book reviews and translations from forms of publications that can be submitted for evaluation in the CESU. However, this applies only to the journals from the B list, and it is perceived as an unfair procedure in the humanities, where book reviews can be an important form of scholarly communication.

4.3 Local use of the points

The research evaluation system designed only for the scientific units has also been used for evaluating individual researchers because it is a very simple way of assessing the outcomes of individuals. As Aagaard (2015) argues on the basis of the Norwegian case, such practices can take place in 'direct and indirect and in both intended and unintended ways' (p. 729). This is an important problem caused by a tight coupling between the national model and its local implementation. This has been observed and discussed in various countries, e.g. Australia, the Czech Republic, Denmark, and Norway (Butler 2003; Schneider 2009; Good et al. 2015). As Aagaard et al. (2015) show, local use of the national models has taken different forms depending on the model construction and the focus on productivity. For instance, the Norwegian and Australian models are similar but cause different consequence in terms of the local use.

In Poland, the rectors, deans, and heads of institutes have to take into account the principles of the CESU and manage their units in such a way that it makes it possible to obtain the highest category. There is no simple solution that could 'translate' the CESU principles into the principles of an individual scholar evaluation. However, some universities[10] have issued regulations that use the CESU regulations: for instance, if you want to obtain a PhD, you have to collect 80 points (apart from writing the thesis); and if you want to obtain a habilitation (the highest academic qualification in Poland), you have to collect 250 points, and your h-index should be at least 3. However, this is only the starting point of the process. It is

an unintended use of the CESU that is developed to serve only for the evaluation of scientific units. Thus, measuring researchers' activities through the system designed for institutions is not appropriate from the perspective of researchers and their career.

One can say that scientists create the outcome of a scientific unit, and this is the reason this tool can be used for the evaluation of the scientists themselves. However, this use of the CESU creates a phenomenon of gathering points that has been humorously labelled as *punktoza*. This term could be translated into English as a type of the *Impactitis*—the impact factor syndrome (Elsaie and Kammer 2009): we have to collect points rather than do the research because it is the number of points that is assessed rather than the excellence of our publications. This *punktoza* triggered many problems; e.g. even the smallest scientific unit wants to have its own journals because it is easier to establish a new journal and publish in it than publish in some other ('foreign') journals—the points can be achieved in many ways, which sometimes favour not quality but quantity of scientific activities. Founding new journals is also stimulated by the CESU parameters. According to Criterion 2, a scientific unit obtains 2 points when its employee is an editor-in-chief of a journal indexed in the ministerial list (the journal must have assigned at least 8 points). Thus, in Poland, in the last few years, there has developed a specific industry that helps in dealing with the research evaluation system, e.g. one can publish every book as a monograph because its 'value' depends only on formal criteria. Institutions organize conferences that only serve the purpose of giving a chapter in a monograph. Other strategies of 'dealing' with the system include, for instance, republishing older works, dividing a book into several volumes, or publishing handbooks as a monograph. The consequence of *punktoza* is a diminishing of the outstanding contribution value. For many scholars, the more 'profitable' strategy is to publish many articles in lower impact factor journals than one paper in a prestigious and excellent journal.

5. The comprehensive evaluation of scientific units in the international context

A comparative analysis requires a framework that can help structure various national systems. The following comparison of the CESU with some other PRFSs takes into account the major attributes pointed out by Hicks (2012): the unit of analysis, the methods of measurement, the frequency, and census period (p. 254).

The national systems have different *units of analysis*, i.e. the subject of the evaluation. For instance, the possible targets of evaluation could be an individual performance, research groups, or at the level of organizations, e.g. departments, faculties, universities, or other whole institutions. Individual performance is evaluated in Spain and New Zealand (Hicks 2012; Molas-Gallart 2012). Research groups, which Hicks (2012) recognizes as the unit of evaluation with the best theoretical support, are evaluated in the UK and Hong Kong Research Assessment Exercises. The evaluation of research groups gives an opportunity to evaluate 'knowledge clusters', i.e. a relatively homogeneous group of organizations. Nonetheless, most of the PRFSs are based on the evaluation at the level of organizations, which could be understood as the field-in-university. Such a solution is used in the Australian, Portuguese, Italian, and Slovakian models, while the Norwegian and Danish models use evaluations at the university level. The Polish model, on the other hand, resembles the Czech Evaluation Methodology, in which there are very

heterogeneous units of analysis that range from departments and universities to national academies of sciences (Good et al. 2015). In Poland, the policymakers try solve the problem with the heterogeneous units through assigning all scientific units to the Joint Evaluation Groups.

Research evaluation systems are challenged by the differences in the patterns of the fields' outputs and the patterns of publishing. Therefore, *methods of measurement* are correlated with the units of analysis. The peer review is used to evaluate the research groups (the UK, Italy, and Portugal) and the individual performance (Spain and New Zealand). The publication or citation-based methods are used for evaluating the units of analysis at the level of organizations. The Australian, Norwegian, and Danish systems are publication based only. The Norwegian model is metrics based; however, publications are counted on the basis of a national research information system (Aagaard et al. 2015). The information about citations is used in the Slovak Republic, Spain, Sweden, and Belgium (Flanders). Sweden focuses on journals and indicators derived from the WoS (Carlsson 2009). In contrast, the Polish model mixes these two approaches: publications in journals are counted on the basis of the national list, which is built for the CESU purposes, and a part of the list is built on the basis of the WoS indicators. Nonetheless, counting publications is more important than incorporating the Thomson-Reuters impact factor into the Polish system, which is why it is a publication-based, rather than citation-based, model.

In terms of *the frequency of evaluation* and *the census period*, it is hard to reveal some patterns; however, there is a tendency towards allocating budgets for longer periods. Flanders and the Scandinavian countries use 1 year of data. In Poland, the CESU is based, as in Portugal, on 4 years data. The funding formula is calculated annually as in the Czech Republic. However, the evaluation is conducted every 4 years. Therefore, the results of the CESU are in force for the whole period and are used in every year to calculate the allocation. The Polish model leads to uncertainty in the planning of research organizations because the regulations of the next CESU are known only 1 or 2 years before it will be conducted. For instance, the 2017 CESU will evaluate the output from 2013 to 2016, and in the middle of 2015, there is only a project of new regulations that will change the form of the Polish PRFS. In Poland, as in the majority of the PRFSs, the percentage of funding that depends on the results of evaluation is small and is assigned each year. In 2014, this ranged from 4 per cent to 22 per cent of the statutory funding (Ratajczak 2014). Such disparities result from evaluating all types of research institutions, which means that some units obtain greater funding based on e.g. the educational size.

6. Summary

Researchers and policymakers have no strong evidence how the CESU has changed the academic practices and Polish publishing industry. The debate concerning the problems and effects of the CESU takes place in academic magazines, daily and weekly magazines, and academic blogs. The impact of the CESU is a common topic of private conversations at conferences and seminars. Nevertheless, there is a lack of research that investigates this complex issue. One can argue that such formal regulations have to transform not only the publishing practices but also the structure of academic promotions and the research itself. Such transformations could occur despite the fact that the CESU is actually an *ex post*

evaluation. The main reason that this process of outcomes measurement is treated as a transformative one is the value of points that scientific units can collect in the CESU. According to most scientists, the points are collected not by scientific units but by the scholars. The points are perceived as a hard 'currency' that can be exchanged for a promotion or a positive result in a university's periodical evaluation. Thus, the Polish policymakers, the management at the scientific unit level, and the scientists have to cope with two major challenges of the CESU: keeping the balance and limiting the unintended use of the CESU.

The first challenge consists in finding the balance between different groups of sciences. The current lack of balance results from two problems of the publication assessment in Poland that have been described in the present article: the publication counting and the devaluation of writing in the national language. Therefore, differentiating parameters within the criteria is not enough to keep the balance. The CESU is based mostly on the formal criteria. However, this type of assessment has brought many discussions, because counting citations is not perceived as the best way for evaluating the SSH and because the procedures for carrying out informed peer review already exist. Hug et al. (2014) and Ochsner et al. (2012) show various alternative criteria and the way to reach the scholars' acceptance through engaging them in the process of defining the criteria. The German research rating (Forschungsrating) provides an example of such integration. It has been successfully implemented in the SSH, for instance, in sociology (Riordan et al. 2011). As Žic Fuchs (2014) observes, 'if "metrics" has to be included in evaluation, then assessment should be *metrics-informed* and not *metrics-led*. The creation of national databases of journals, monographs, and other research outputs is the necessary first step in achieving "healthy" and quality-oriented research performance assessments in the humanities' (p. 114). Hence, the current Polish solution based on the Questionnaire of Scientific Unit is insufficient. For instance, such a system makes it possible to report false publications, which have to be noticed by the members of the evaluation teams. The whole solution cannot be implemented without a proper academic database. Only this will make the research evaluation fully possible and transparent. It is important for all scientometricians who conduct the CESU to have the proper technologies used for the performance measurement. As the Norwegian (Sivertsen 2016) and Flemish (Verleysen, Ghesquiere and Engels 2014) policies show, such a lack of proper databases can be resolved. In such a publication-based evaluation system, data sources that cover all areas of research have to be used. Only then could the comparable measurement actually be implemented.

The other challenge is closely connected with the first one. The local use of the CESU for evaluating an individual researcher has destructive consequences, i.e. focusing rather on the researchers' productivity (i.e. quantity) and not on the quality of their works. This can only be avoided when the management at the unit level does not play with the system (e.g. founding new journals only for gaining points) and does not rely only on the point system (e.g. more peer review for evaluating academic staff).

The improvement of the CESU is possible if the policymakers decide to invite researchers to fully participate in defining the criteria and phases of evaluation and if they suggest some form of a metrics-informed assessment. It is a prerequisite for building trust and confidence in the assessment procedure. Hence, one could design regulations for different groups of sciences which would take into account the scientific practices characteristic for different groups of sciences. The next step of improvement would be to make the evaluation procedure fully transparent: this applies to the final criteria as well as the results. Moreover, the data about publications and outputs should be open and ready for a reuse. In this way, the Polish model could be revised gradually.

Notes

1. The Committee was founded in 2010 and consists of four commissions: one for each group of the sciences.
2. The criteria for this process were presented in July 2012 in the Regulation of the Ministry of Science and Higher Education of 13 July 2012 on criteria and procedure of assigning scientific categories to scientific units. The final version of criteria was published after the whole process of evaluation in March 2014.
3. The Specialist Team was founded in 2012 and is responsible for annually preparing a list of scientific journals in which publication is acknowledged in the CESU.
4. The result of the 2013 CESU was published in the *Komunikat Ministra Nauki i Szkolnictwa Wyższego z dnia 4 lipca 2014 r. o przyznanych kategoriach naukowych jednostkom naukowym* [the Regulation of the Ministry of Science and Higher Education of 4 July 2014 on assigned scientific categories to scientific units].
5. Koczkodaj, Kuakowski and Ligęza (2014) described the process of evaluation in six steps and assigned them official formulas from the Regulation of the Ministry of Science and Higher Education as of 13 July, 2012 on criteria and procedure of assigning scientific categories to scientific units.
6. It is very hard to give the exact and final number of evaluated items. The difficulties result from the quality of the submitted data (e.g. incorrect titles of publication or wrong numbers of authors). Moreover, the evaluated items from different scientific units have never been unified in a single database. Therefore, one cannot indicate in any simple way how many evaluated items have been generated by the given publication.
7. Data come from the Index Copernicus International—an official technical operator of the CESU. The author of the present article asked for the data by email sent 8 February 2015.

8. In Poland, the list of congress languages comprises English, German, French, Spanish, Russian, and Italian. Additionally, a language defined as 'fundamental for the given discipline' is also included, e.g. Czech for Czech philology.

9. All these journals are peer reviewed. The ministerial list does not include the student journals or the cultural magazines. Every journal indexed in the ministerial lists has to fulfil various criteria, e.g. publishing a list of reviewers and revealing the form of peer review (the double-blind option is recommended). Also, every issue should contain at least two scientific articles.

10. To illustrate this, we may give the official regulations for the candidates for the habilitation degree of some higher education institutions. Thus, for example, (1) the Institute of Fundamental Technological Research Polish Academy of Sciences (the Regulation of 16 October 2013) requires at least h-index = 4 and at least 50 citations according to the WoS, (2) the Medical University of Bialystok requires at least h-index = 7 and at least 200 points (the Regulation of the Medical University of Bialystok of 27 February 2012), and (3) the Military Institute of Medicine requires at least 150 points (the Regulation of the Military Institute of Medicine of 17 April 2013). The required number of citations or points is often labelled as 'recommended'. However, the majority of such regulations stipulate that the candidate 'has to' collect e.g. the given number of points.

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