Brief Communication: The Use of Various Models of Work Distribution in the Analysis of the Czech System of Evaluation of Research

Roman Solc

Department of Anthropology and Human Genetics, Faculty of Science, Charles University, Vinicna 7, Prague 2, 128 00, Czech Republic,
<roman.solc@natur.cuni.cz>

Roman Solc (1986) is a member of the Department of Anthropology and Human Genetics, Faculty of Science, Charles University, Prague. He specializes in human molecular cytogenetics. He also deals with the genetics of circadian rhythms, genetics of psychical disorders, didactics of biology and evaluation of science. He also popularizes science as an author, translator or lecturer.

Solc, Roman. 2020. "The Use of Various Models of Work Distribution in the Analysis of the Czech System of Evaluation of Research." *Knowledge Organization* 47(4): 357-363. 2 references. DOI:10.5771/0943-7444-2020-4-357.

Abstract: This article builds on our previous work, when we critically analyzed some aspects of the research evaluation system valid in the Czech Republic until 2017. This article also focuses on the evaluation of articles in journals with IF, but develops the relationship between so-called RIV-points allocated by the system and the amount of work done, using different models of work distribution. The results generally support the conclusions of the original study.

Received: 9 May 2020; Accepted: 13 May 2020

Keywords: work unit, Information Register of R&D results ("RIV"), journals, RIV points

1.0 Introduction

In the past, we have already written some critical notes on the system of evaluation of research valid until 2017 in the Czech Republic (Solc 2014; Solc 2019). We described how every scientific article (or generally every scientific output) was registered in the database known as the *Information Register of R&D Results* (*Rejstřík informací o výsledcích* (https://www.rvvi.cz/riv), hence "RIV") and how each receives some points (further only RIV-points), which are allocated to individual authors and institutions. In case of scientific articles published in the affected journals, the points were calculated using the algorithm

$$\text{RIV-points} = 10 + 295*[(1-N)/(1+(N/0.057))]$$

where "N-value" is the normalized ranking of the periodical, and

$$N = (P-1)/(Pmax-1)$$

where "P" is the periodical's ranking according to the *Journal of Citation Reports* (JCR) in a series sorted in the descending order by IF and where "Pmax" is the total number of periodicals in the given field according to the JCR (Solc 2019) (see Figure 1).

Then, we defined the concept of "RIV-points/work-unit" to find a way how to confront an amount of work embedded in creating an article with a number of acquired RIV-points. We took an article in a journal with N=1 as the base-line (the necessary amount of work taken as one) and assumed that the embedded extra work is inversely proportional to the "N-value," so when N=0, the amount of work is 30.5, proportionally according to the minimal and maximal amount of RIV-points. Then we needed a ratio between the acquired RIV-points and theoretically constructed amount of work. So, we proposed the algorithm

$$\text{RIV-points / work-unit} = \text{RIV-points} / ((1-N)*29.5+1)$$

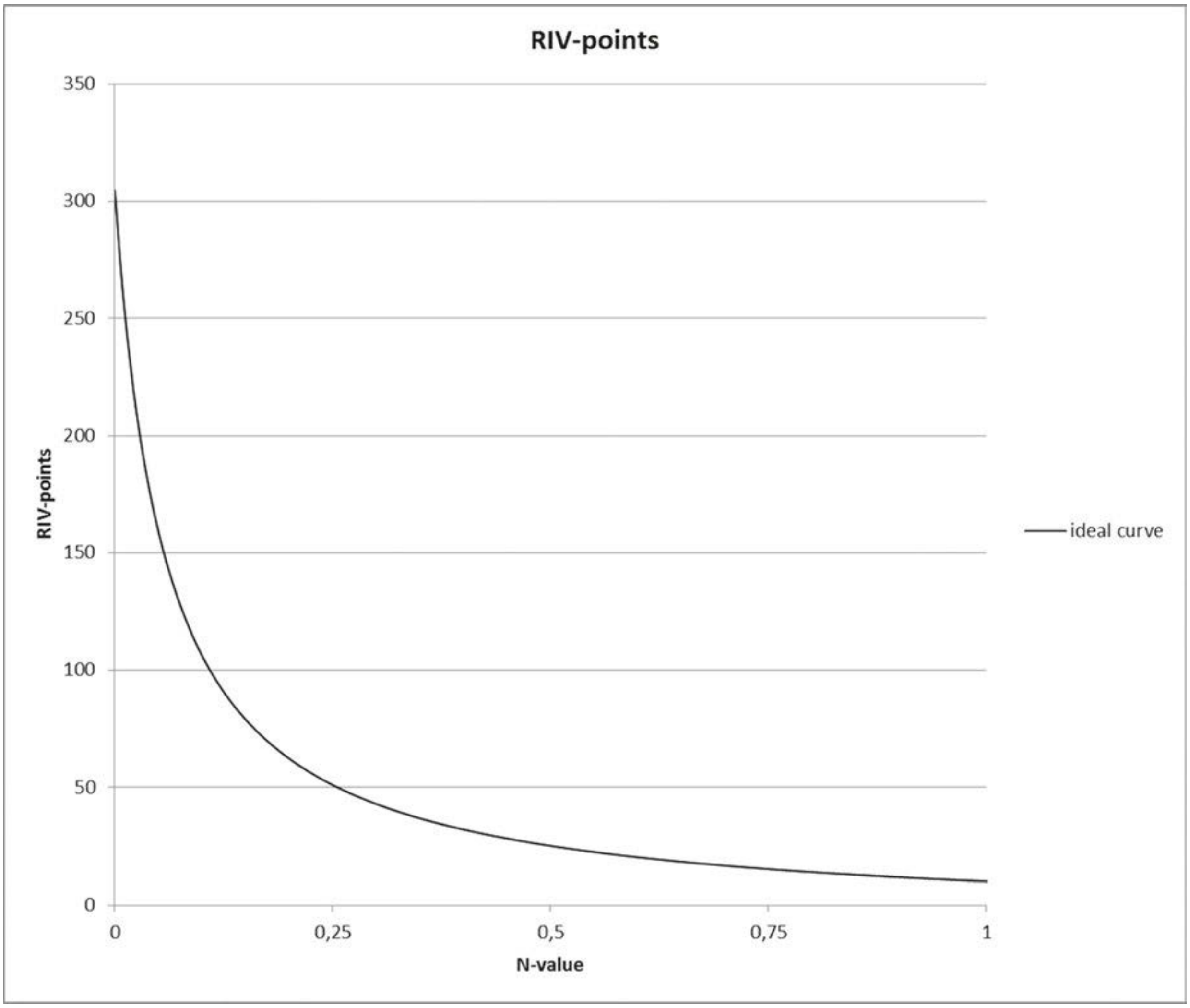

Figure 1. The ideal curve representing the relationship between acquired RIV-points and N-value of the journal in which an article has been published.

which is applicable with N from the interval <0;1> and get the curve of "RIV-points/work-unit" (Solc 2019).

Since this time, we got some questions, such as what if the increment of work is not linear in the whole interval <0;1>, and how would it affect our conclusions? Therefore, in this article, we will try to answer and show more models of amount of work distribution and its consequences.

2.0 Material and methods

As in our previous study, we started with the distribution of work done. Again, we took an article in a journal with N=1 as the base-line (the necessary amount of work taken as one work-unit) and defined the maximal amount of work as 30.5 work-units, proportionally according to the minimal and maximal amount of RIV-points. But then we defined five different types of work distribution and calculated "RIV-points/work unit" for every type.

Type 1

Type 1 (see Figures 2, 3, 4, and 5) represents the original model, which assumed that the embedded work is linear and inversely proportional to the "N-value." It means that

work-unit (type 1) = 1 + (1-N)*29.5
with N from <0;1>.

Type 2

Type 2 (see Figures 2 and 3) represents a situation when if the N-value decreases (the journal rises in the ranking), the amount of embedded work rises slowly at first and then accelerates. First we devised a curve (type 2A) which is the same as the curve of RIV-points distribution. So

work-unit (type 2A) = 1 + 29.5*[(1-N)/(1+(N/0.057))]
with N from <0;1>.

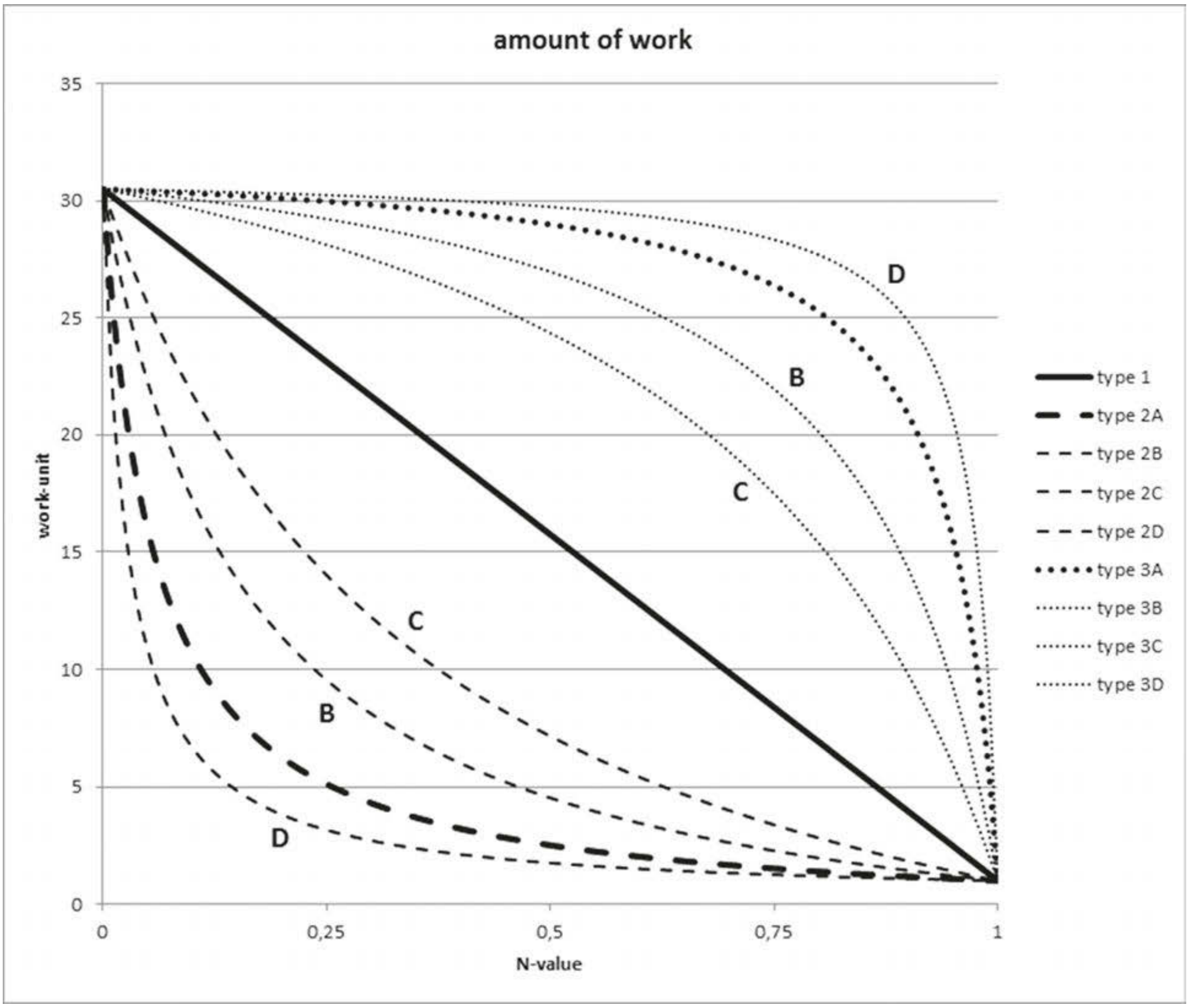

Figure 2. Different types of amount of work distribution.

Then we devised three more similar curves with different curvature (types 2B, 2C and 2D).

work-unit (type 2B) = 1 + 29.5*[(1-N)/(1+(N/0.157))]

work-unit (type 2C) = 1 + 29.5*[(1-N)/(1+(N/0.357))]

work-unit (type 2D) = 1 + 29.5*[(1-N)/(1+(N/0.027))]

with N from <0;1>.

Type 3

Type 3 (see Figures 2 and 3) represents a situation opposite to type 2. So if the N-value decreases (the journal rises in the ranking), the amount of embedded work rises quickly at first and then decelerates. First we devised a curve (type 3A) which is the opposite to the curve of RIV-points distribution. So

work-unit (type 3A) = 30.5 – 29.5*[(1-(1-N))/(1+((1-N)/0.057))]

with N from <0;1>.

Then we devised three more similar curves with different curvature (types 3B, 3C and 3D).

work-unit (type 3B) = 30.5 - 29.5*[(1-(1-N))/(1+((1-N)/0.157))]

work-unit (type 3C) = 30.5 - 29.5*[(1-(1-N))/(1+((1-N)/0.357))]

work-unit (type 3D) = 30.5 - 29.5*[(1-(1-N))/(1+((1-N)/0.027))]

with N from <0;1>.

Type 4

Type 4 (see Figures 4 and 5) represents a situation when if the N-value decreases (the journal rises in the ranking), the amount of embedded work grows linearly at first and

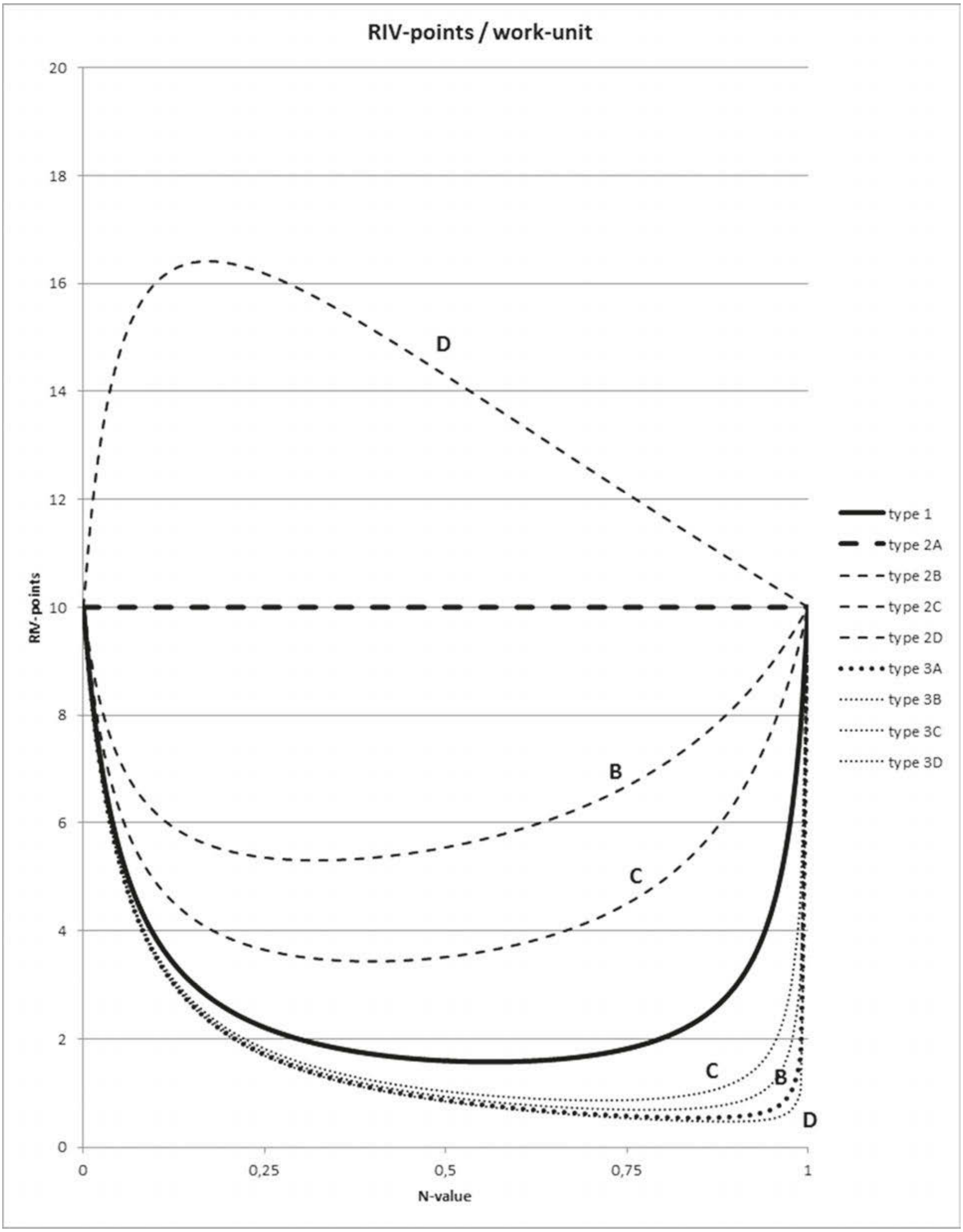

Figure 3. The curves representing the relationship between the RIV-points acquired for the unit of work and N-value of the journal in which an article has been published.

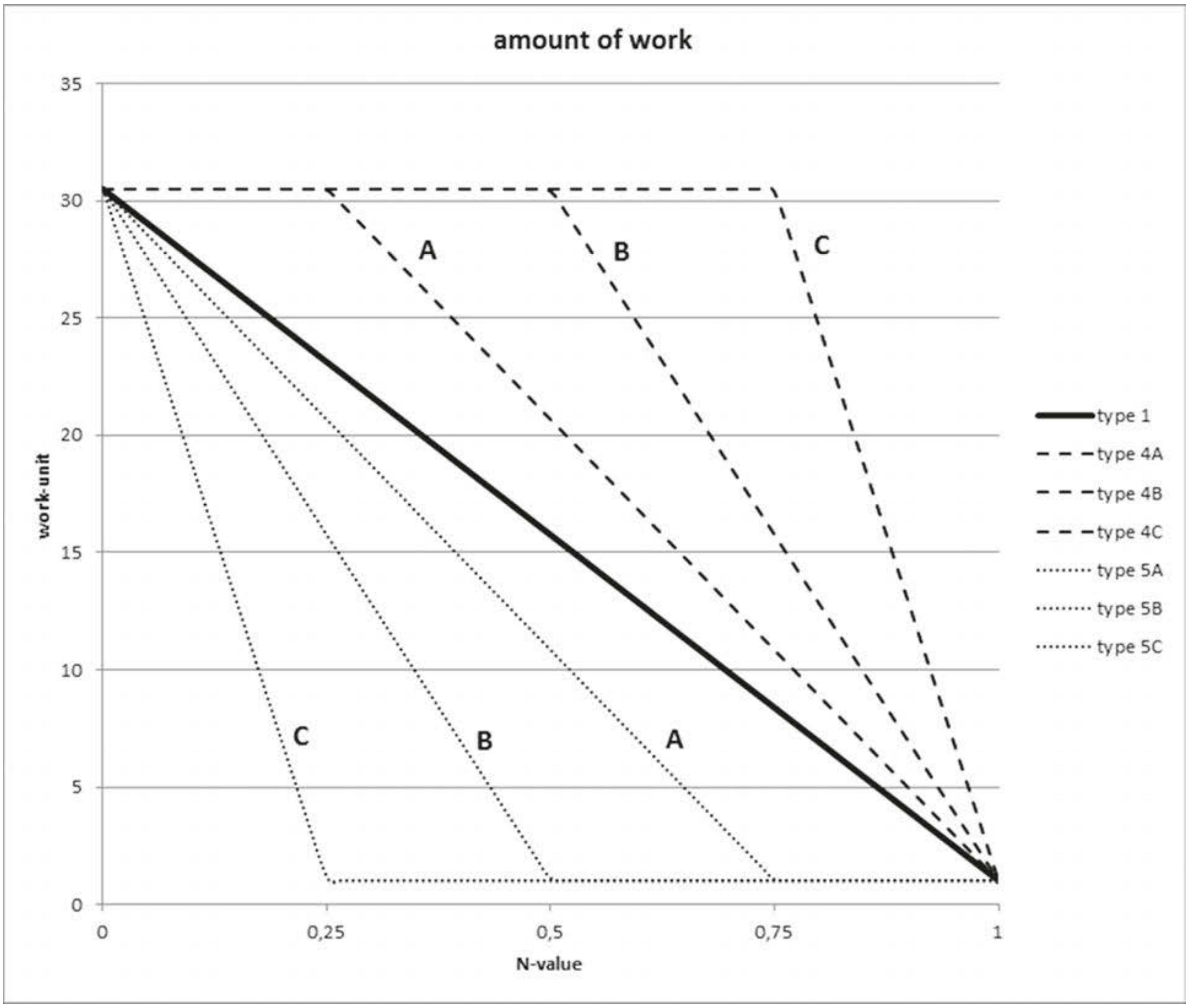

Figure 4. Different types of amount of work distribution.

then stays in plateau on maximum. We devised three curves with different lengths of plateau (types 4A, 4B and 4C).

work-unit (type 4A) = 30.5 (with N from <0;0.25>)
and
work-unit (type 4A) = 1 + (1-N)*(4/3)*29.5
with N from <0.25;1>.
work-unit (type 4B) = 30.5 (with N from <0;0.5>)
and
work-unit (type 4B) = 1 + (1-N)*2*29.5
with N from <0.5;1>.
work-unit (type 4C) = 30.5 (with N from <0;0.75>)
and
work-unit (type 4C) = 1 + (1-N)*4*29.5
with N from <0.75;1>.

Type 5

Type 5 (see Figures 4 and 5) represents a situation when if the N-value decreases (the journal rises in the ranking), the amount of embedded work stay in plateau on minimum and then grows linearly. Again, we devised three curves with different lengths of plateau (types 5A, 5B and 5C).

work-unit (type 5A) = 1 + ((1-N)-0.25)*(4/3)*29.5
with N from <0;0.75> and
work-unit (type 5A) = 1 (with N from <0.25;1>).
work-unit (type 5B) = 1 + ((1-N)-0.5)*2*29.5
with N from <0;0.5> and
work-unit (type 5B) = 1 (with N from <0.5;1>).
work-unit (type 5C) = 1 + ((1-N)-0.75)*4*29.5
with N from <0;0.25> and
work-unit (type 5C) = 1 (with N from <0.75;1>).

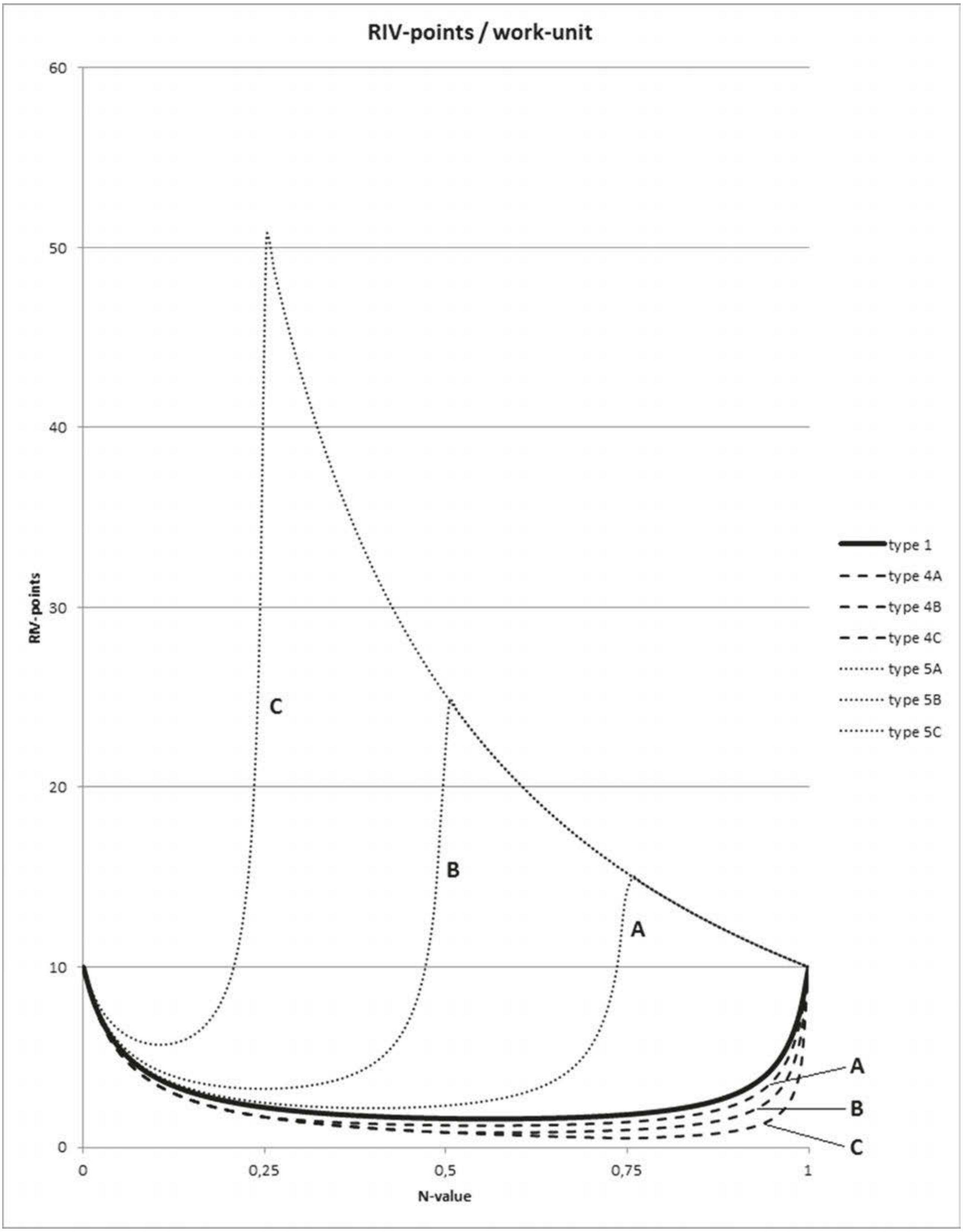

Figure 5. The curves representing the relationship between the RIV-points acquired for the unit of work and N-value of the journal in which an article has been published.

3.0 Results

The two graphs (Figures 2 and 4) show models of the dependence of the amount of work on the N-value. The other two graphs (Figures 3 and 5) show the conversion of RIV-points per work-unit. Type 1 and (in Figures 2 and 3) types 2A and 3A (opposite to type 2A) are highlighted.

We can see that the only model in which the distribution of points would be constant is type 2A. Except for the type 2D and the parts of the waveform of the type 5 models, the waveform of the curves shows the reduction in the amount of points assigned to the work-unit between the maximum and minimum N-values. For type 3 and 4, the minimum number of points allocated decreases compared to type 1 (used in Solc 2019) and, in addition, shifts from the centre of the curve (N ~ 0.5) towards N = 1. In the case of type 2B and 2C, the minimum amount of assigned points increases compared to type 1 and, in addition, shifts from the centre of the curve (N ~ 0.5) towards N ~ 0.25 (towards N = 0 respectively). Type 5 curves rise sharply until the work increment is zero, then they behave similarly to type 2B and 2C. Only in the case of the type 2D model is the whole course of the curve above the value at the maximum and minimum N-value and reaches its maximum at N < 0.25.

4.0 Discussion

In Solc (2019), it is stated (using the model that we now defined as type 1) that the most effective way of applying the outputs of any scientific work is to publish them either in journals with a very high IF (very low N-value; e.g., the first quartile of JCR categories) or in journals with a very low IF (very high N-value; e.g., the fourth quartile of JCR categories), and that the most disadvantageous way is to publish in journals from the second and third quartile of JCR categories (the journals with an average IF). This is further problematized by the difference between the "ideal" and "real" distribution of RIV-points (which leads to the fact that even work on articles published in journals from the first quartile is often underestimated). We can now confront this statement with other models of distribution of work.

Only if the amount of work spent on the publication corresponded to the type 2A model, the problem described in Solc (2019) would disappear and the amount of RIV-points obtained would correspond to the amount of work done. However, we have no evidence that this model is true.

In the case of close variants (types 2B and 2C) we can observe a similar problem as in type 1. However, the disadvantage is smaller and excels especially for journals from the second quartile. This disadvantage is less as the curve is more similar to type 2A. Type 2D is the only one to offer the opposite situation compared to type 1. In this case, the articles published in journals from the second and third quartiles (especially from the second quartile and part of the first quartile respectively) would be overestimated.

Using models of types 3 and 4, we can observe that the disadvantage increases compared to type 1. In particular, there is an increased underestimation of articles in journals from the third quartile and, in addition, there is a strong disadvantage in the case of journals from the fourth quartile. If the distribution of the work corresponded to these models, indeed the system of RIV-points could motivate to publish in journals from the first and second quartiles. Here, however, we collide a discrepancy between the "ideal" and "real" distribution of RIV-points. Overall, there would be a general underestimation of publications in all journals, compared to the declared target of the system of evaluation.

In the case of type 5 models, there would be an intensive advantage for publications in journals with low IF in the range of the plateau of the increase of necessarily spent work. For the rest, the same would apply proportionally as for type 1.

In conclusion, we can state that even with the use of different types of work distribution curve, the thesis that the system of evaluation of scientific articles in journals with IF valid in the Czech Republic until 2017 even in the "ideal" state led to underestimation writing articles, especially in the case of articles in journals from the second and third quartiles of JCR rankings, remains valid for the vast majority of the models.

References

Solc, Roman. 2014. "Brief Communication: The Czech Systém of Evaluation of Science Research Handicaps Interdisciplinary Science." *Knowledge Organization* 41: 410-13.

Solc, Roman. 2019. "Brief Communication: Some Critical Notes on the Czech System of Evaluation of Research." *Knowledge Organiztion* 46: 387-97.