

R&D Evaluation Methodology and Funding Principles

Background Report: The ex-ante assessment of the proposed funding system



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

R&D Evaluation Methodology and Funding Principles

Ex-ante assessment of the proposed funding system

January, 2015

Tomas Ratinger, TC SACR
Ondrej Pecha, TC ASCR

Table of Contents

1. Introduction	4
2. Methodology	7
2.1 Mathematical description of institutional financing	7
2.2 The architecture of the quantitative assessment of the institutional financing proposals	9
2.3 Model scheme	10
2.4 Static simulation	14
2.5 Dynamic simulation	15
2.6 Visualisation of results	20

3. Scenarios	21
4. Results of the simulations	21
4.1 Investigated issues	21
4.2 The size effect in Approach A	23
4.3 Approach B	29
4.4 Conclusions	32

Table of Figures

Figure 1 The three components of institutional funding.....	5
Figure 2 Basic architecture of the quantitative tool	9
Figure 3 Alternative distribution of PRFS budget to the pots.....	10
Figure 4 Model scheme	12
Figure 5 Dynamic simulation control parameters	18
Figure 6 An example of scenarios	19
Figure 7 Institutional Funding given by Approach A: single provider	22
Figure 8 Total (average) scores and percentage change of total IF	23
Figure 9 the relationship between the evaluation scores (Total Score) and PRFS allocations.....	24
Figure 10 The relationship between RIV points intensity (RIV points/AR) and the Total Score resulting from the new evaluation methodology.	25
Figure 11 The output intensity and IF change.	26
Figure 12 Percentage change of Total IF, quartic transformation	27
Figure 13 IF distributions in Period 2 and Period 3 relatively to IF allocations in Period 1.....	28
Figure 14 The relationship between evaluation scores and % change of IF in Approach B in the first period	29
Figure 15 The changes of IF after three evaluation and financing periods	30
Figure 16 The relationship between the “distribution to pots” scenarios in terms of Total IF. Approach A.	31

List of Tables

Table 1 Criteria for PRFS budget adjustment.....	8
Table 2 IF changes, number of cases (EvUs) in various categories of significance.....	27
Table 3 The benefit of quartic transformation of scores	28
Table 4 “Distribution to pots” scenarios.....	31
Table 5 The effect of distribution to pots on Total IF in different scenarios	32

1. Introduction

The report refers to Work Package 8 in the study designing a new R&D evaluation methodology and funding principles. The main objective of this WP is to assess the impacts of the new institutional funding system on the Czech research organisations (ROs). It translates in four partial objectives

1. Developing RO models for assessing the impacts of the proposed funding system across several years.
2. Setting principles for deciding minimum institutional funding amounts and how to limit upward swings in funding to amounts that can be efficiently absorbed.
3. Conducting an impact assessment of the proposed funding schemes
4. Proposing how to monitor the behaviour of the RO in order to minimise the scope to 'game' the system

In this report we concentrate on the objectives 1 and 3.

The proposed institutional funding is described in the 2nd Interim Report. Under Institutional funding we understand the general funding of institutions with no direct selection of R&D project or programmes. In the current Czech system it is the support to the development of the research organisation.

In our analysis, we consider also the former 'research intentions' funding (vyzkumne zamery) as a form of institutional funding since they were not subject to competition among research organisations or teams and actually have been replaced by the 'support to the development of research organisations' budget line.

The new system of institutional funding (IF) is supposed to have three elements

- i) Block grant (Block) – fixed sum or proportion of the public funding budget allocated to a research organisation (RO). The research organisation commits itself to reaching some long-term strategic targets for development, when using these resources.
- ii) Performance agreements (PA)
- iii) Performance-based research funding (PRFS) – proportion of the public funding budget that is specifically dedicated for the funding of research and is driven by indicators that assess the performance of the organisations, such as quality of the research, relevance for innovation/society etc.

This distribution is illustrated in the scheme below (Figure 1)

In the 2nd Interim Report it is proposed that the IF budget (of a provider) is first allocated to two IF components (Block, PA) as a fixed proportion of the past (base year) IF. The PRFS part will be adjusted to the actually available budget (i.e. it can decrease, stay the same or increase). In the next step, the PRFS component is further distributed to pots per RO types (Scientific RO – ScRO, RTO, Public service RO - PubL and National resources – NatRes) and based on the evaluation criteria (Management,

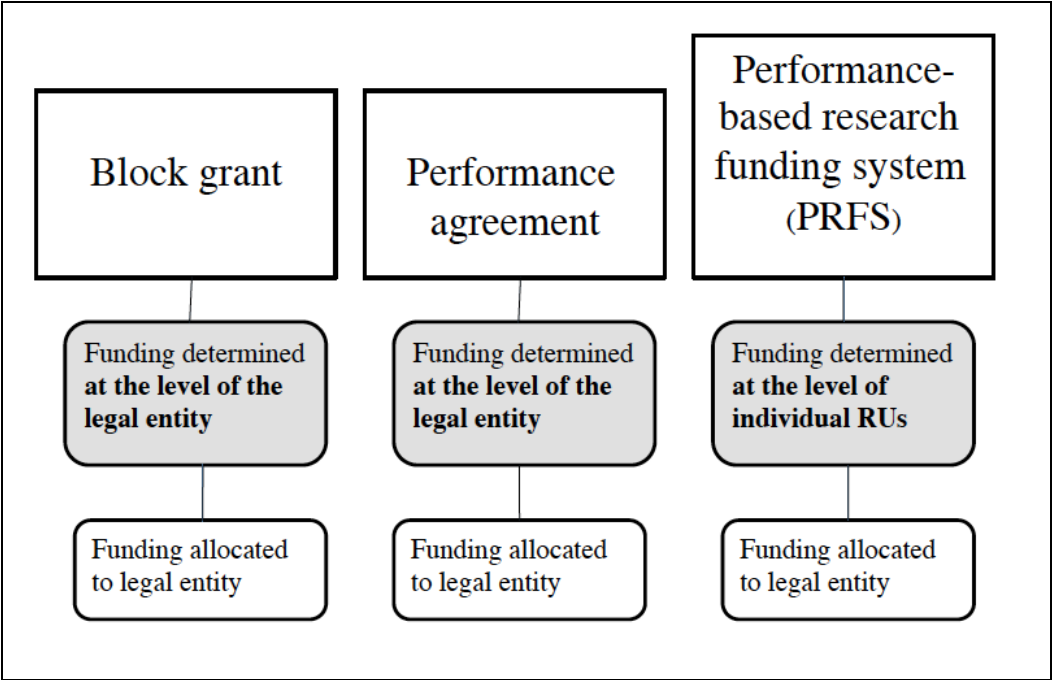
Internationalisation, Excellence, Performance, Societal Relevance¹). This idea is further described in Section 2.2.2.

Distribution of the PRFS pots to individual RO (legal entities) will be based on performance against each of the 5 assessment criteria as expressed in the evaluation scores. Two basic methods are considered:

- A) Summarising person scores in each category given by RO type and evaluation criteria at the provider level, the calculating value of the person score and finally allocating funds based on the number of person scores of each evaluated RU (or EvU) in each evaluation category.
- B) Calculating average scores in each category given by RO type and evaluation criteria weighted by the number of active researchers (presumably in the FTE). The distance of actual scores of a RU (EvU) from the average in each category is the base for distributing the PRFS funds.

In both cases, the budget allocated to RUs (EvU) is summed up to the level of the corresponding RO.

Figure 1 The three components of institutional funding



Source: 2nd Interim Report

The ex-ante assessment covered the following topics: while the basic approach for the funding distribution has been developed, the actual distributions are not fully settled. In addition, there is no information on the budget development in the future. These are aspects that have to be considered in alternatives.

¹ These are abbreviations for the 5 assessment criteria defined in the EM, respectively Research environment, membership of the global and national research community, scientific research excellence, research performance, and societal relevance (see the 1st Interim Report)

Ex-ante assessment of the proposed funding system - Draft version for public consultation

The crucial uncertainty is about the evaluation results: the simulations of effects necessarily require the evaluation scores. We solved this by looking into the effects of several alternatives versus the initial score setting.

In this report and in the simulation model, the following abbreviations for the types of RO are used:

- ScRO - Scientific Research organisations
- RTO – Research and Technology Organisations
- PubL – Public Service Research Organisations
- NatRes - National resources /Infrastructure Research Organisations

It should be understood that the current ex-ante assessment model has been developed close-to-contemporaneously to the evaluation methodology. This implies that elements of the EM that informed the ex-ante assessment, such as the 4-point scores, are based on the version of the EM that was presented in the draft version of the 1st Interim Report. Wherever relevant, the model will adapt to the changes in the EM that have been introduced in the final version of the 1st Interim Report (and any eventual other changes in the future).

2. Methodology

2.1 Mathematical description of institutional financing

The institutional financing Y of a RO (j) of the RO-type (i) in time (t) is given by three components

$$Y_{ij}^t = B_{ij}^t + P_{ij}^t + X_{ij}^t,$$

Where B_{ij}^t stands for the block financing, P_{ij}^t for performance agreement and X_{ij}^t represents the performance based component (PRFS). B_{ij}^t and P_{ij}^t are given as fixed proportions (α and β respectively) of the previous year institutional budget Y_{ij}^{t-1} . In this sense, their modelling is simple.

The budget X_i^t for the RO-type (i) will be distributed to individual ROs ($j=1, \dots, n_i$)

$$X_i^t = \sum_j X_{i,j}^t. \quad (1)$$

There are two main approaches to do it which will be discussed below. For the both approaches it holds

- i) X_i^t is largely predetermined

$$X_i^t = (1 - \alpha - \beta)Y_i^{t-1}g_t, \quad (2)$$

where g_t is an index of the R&D budget growth (it can also be made RO-type specific or provider specific)

- ii) X_i^t is distributed to five pots according to evaluation criteria (Excellence, Performance, Societal impact, Internationalization, Management),

$$X_i^t = \sum_{k=1}^5 w_{ik} X_{i,k}^t, \quad (3)$$

where w_{ik} are weights of social importance of research conduct aspects (different for each RO-type) for which holds $\sum_{k=1}^5 w_{ik} = 1$. The weights are exogenous, they should be agreed by R&D policy makers.

2.1.1 Approach A

The idea of Approach A is that the distribution of the PRFS budget (X_i^t) to individual ROs (equation 1) is done on basis of manscores i.e. the number of scientific staff times (L_j^{t-1}) the score in the k-th evaluation criterion $E_{i,k,j}^t$. Thus for each RO (j) the manscore $E_{i,j,k}^{*t} = L_j^{t-1} E_{i,k,j}^t$. The total of manscores for the i-th RO-type and criterion k is given by

$$E_{i,k}^{*t} = \sum_{h=1}^{n_i} L_h^{t-1} E_{i,k,h}^t, \quad (4)$$

Note, that we use the upper index t in the case of the current evaluation and the index t-1 for scientific labour. Concerning the latter, it because the labour will grow at the half rate of the IF budget change (L^t will refer to X^t and Y^t).

The PRFS budget ($X_{i,k,j}^t$) will be allocated to a RO (j) by using the share of j-manscores on the total manscores in the particular evaluation area (k) i.e.

$$X_{i,k,j}^t = X_i^t \frac{E_{i,j,k}^{*t}}{E_{i,k}^{*t}} = X_i^t \frac{L_j^{t-1} E_{i,k,j}^t}{\sum_{h=1}^{n_i} L_h^{t-1} E_{i,k,h}^t} = X_i^t w_{i,k} \frac{L_j^{t-1} E_{i,k,j}^t}{\sum_{h=1}^{n_i} L_h^{t-1} E_{i,k,h}^t}, \quad (5)$$

Finally, the PRFS budget of the RO j will be

$$X_{i,j}^t = X_i^t \sum_{k=1}^5 w_{i,k} \frac{L_j^{t-1} E_{i,k,j}^t}{\sum_{h=1}^{n_i} L_h^{t-1} E_{i,k,h}^t} = (1 - \alpha - \beta)Y_i^{t-1}g_t \sum_{k=1}^5 w_{i,k} \frac{L_j^{t-1} E_{i,k,j}^t}{\sum_{h=1}^{n_i} L_h^{t-1} E_{i,k,h}^t}. \quad (6)$$

If we have ROs with several evaluated units (EvU) then we do the same algorithm as above and we summarise PRFS values of EvUs to the RO levels.

2.1.2 Approach B

The idea of the approach B is that we calculate weighted average score for each of the k evaluation areas/criteria. The financing will reflect the departure of the RO from that average.

The average score weighted by employed scientific labour for the evaluation area (k) of a RO-type (i) is defined as follows

$$\bar{E}_{ik}^t = \frac{\sum_{h=1}^{n_i} L_h^{t-1} E_{i,k,h}^t}{\sum_{h=1}^{n_i} L_h^{t-1}} = \sum_{j=1}^{n_i} \frac{L_j^{t-1}}{\sum_{h=1}^{n_i} L_h^{t-1}} E_{i,k,j}^t \quad (7)$$

One option is to allocate the PRFS budget using the ratio $E_{i,k,j}^t / \bar{E}_{i,k}^t$ which in turn means that

$$X_{ij}^t = X_i^t \sum_{k=1}^5 w_{i,k} \frac{E_{i,k,j}^t}{\bar{E}_{i,k}^t}$$

$$X_{ij}^t = X_i^t \sum_{k=1}^5 w_{i,k} \frac{E_{i,k,j}^t}{\sum_{l=1}^{n_i} \frac{L_l^{t-1}}{\sum_{h=1}^{n_i} L_h^{t-1}} E_{i,k,l}^t} = (1 - \alpha - \beta) Y_i^{t-1} g_t \sum_{k=1}^5 w_{i,k} \frac{E_{i,k,j}^t}{\sum_{l=1}^{n_i} \frac{L_l^{t-1}}{\sum_{h=1}^{n_i} L_h^{t-1}} E_{i,k,l}^t}. \quad (8)$$

The other option is to state ranges of the departure from the average \bar{E}_{ik} . We consider in our model that the borders are given by standard deviations d^+ and d^- .

$$(d_{i,k}^t)^2 = \frac{\sum_{j=1}^{n_i} L_j^{t-1} (E_{i,k,j}^t - \bar{E}_{i,k}^t)^2}{\sum_{h=1}^{n_i} L_h^{t-1}}. \quad (9)$$

The basic criteria are proposed in Table 1.

Table 1 Criteria for PRFS budget adjustment

Criteria	PRFS budget changes between periods (t-1) and (t).
$E_{i,k,j}^t \geq \bar{E}_{i,k}^t + d_{i,k}^t$	+10%
$\bar{E}_{i,k}^t \leq E_{i,k,j}^t < \bar{E}_{i,k}^t + d_{i,k}^t$	+5%
$\bar{E}_{i,k}^t - d_{i,k}^t < E_{i,k,j}^t < \bar{E}_{i,k}^t$	-5%
$E_{i,k,j}^t < \bar{E}_{i,k}^t - d_{i,k}^t$	-10%

The budget changes can be evaluation area specific, in this case the table will have 6 columns.

Because it is very unlikely that the distribution of evaluation scores will be fully symmetric we need to recalculate the primarily allocated PRFS to the level of actually available budget. Denote $\hat{X}_{i..}^t$ the budget calculated by using Table 1. Then

$$\hat{X}_i^t = \sum_{j=1}^{n_i} \hat{X}_{i,j}^t \text{ and } \hat{X}_{i,j}^t = \sum_{k=1}^5 \hat{X}_{i,k,j}^t \quad (10)$$

To make the LHS of equation (10) being equal X_i^t as defined in equation (2) we have to multiply the RHS by the ratio X_i^t / \hat{X}_i^t . We have

$$\hat{X}_{i,k,j}^t = \epsilon_{i,k,j}^t (1 - \alpha - \beta) Y_{i,j}^{t-1} w_{i,k} g_t, \quad (11)$$

where $\epsilon_{i,k,j}^t$ is the concrete PRFS budget change given by rules of Table 1. Consequently, we can express \hat{X}_i^t as

$$\hat{X}_i^t = \sum_{j=1}^{n_i} \sum_{k=1}^5 \hat{X}_{i,k,j}^t = (1 - \alpha - \beta) g_t \sum_{j=1}^{n_i} Y_{i,j}^{t-1} \sum_{k=1}^5 \epsilon_{i,k,j}^t w_{i,k} \quad (12)$$

Using equation (2) for X_i^t we yield

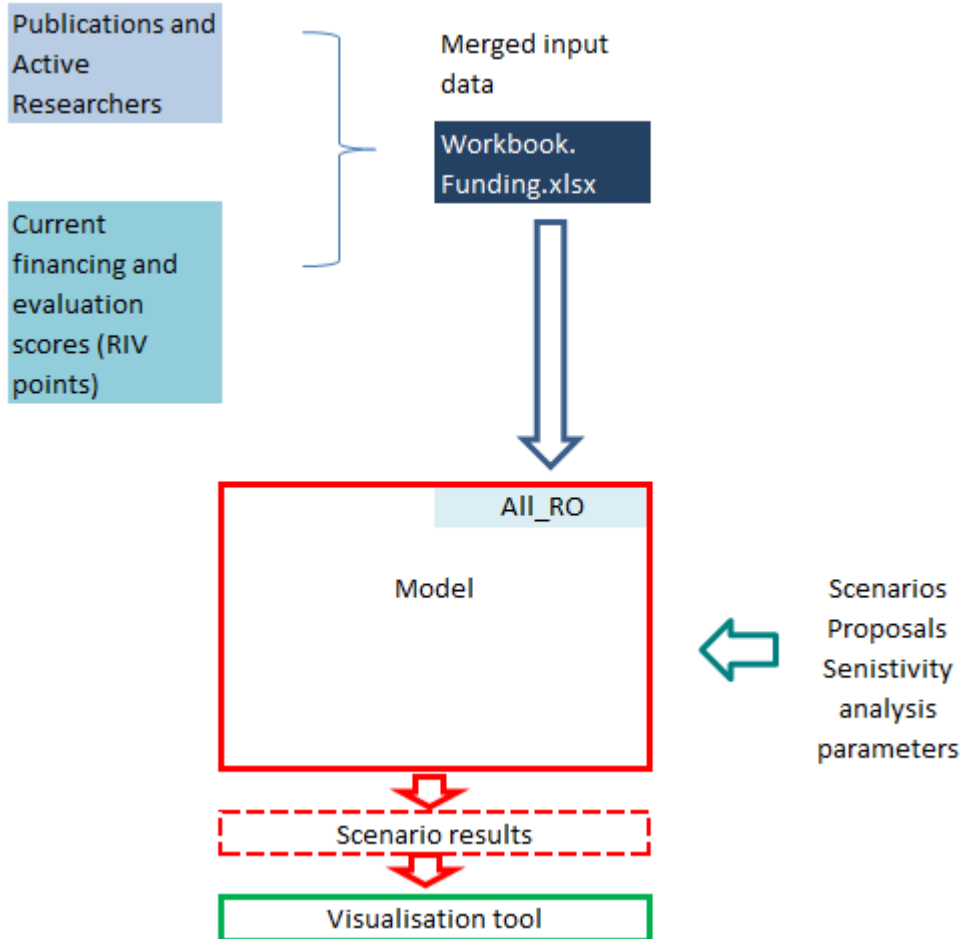
$$\frac{X_i^t}{\hat{X}_i^t} = \frac{(1-\alpha-\beta)Y_i^{t-1}g_t}{(1-\alpha-\beta)g_t \sum_{j=1}^{n_i} Y_{ij}^{t-1} \sum_{k=1}^5 \epsilon_{ikj}^t w_{i,k}} = \frac{Y_i^{t-1}}{\sum_{j=1}^{n_i} Y_{ij}^{t-1} \sum_{k=1}^5 \epsilon_{ikj}^t w_{i,k}}. \quad (13)$$

Alternatively, the budget can be balanced in each social priority (evaluation area).

2.2 The architecture of the quantitative assessment of the institutional financing proposals

The architecture of the quantitative assessment tool has four components: two input components (1) data to feed the model and (2) scenarios to be assessed by the model; (3) the model and (4) the visualisation tool helping to interpret the results.

Figure 2 Basic architecture of the simulation tool



Some data manipulations are programmed (e.g. merging the input databases, or generating scenario results), while the rest is done by copy/paste (from Funding.xlsx to the model or from the model-scenario results into the visualisation tool). The simple copy/paste manipulation allows for greater flexibility in data transfer.

Ex-ante assessment of the proposed funding system - Draft version for public consultation

In the workbook Funding.xlsx, the user can find the analysis of the current distribution of IF to RO types and FOS.

2.3 Model scheme

The model for simulating effects of scenarios of the new institutional funding is made in excel workbook using Visual Basic procedures (programmes, subroutines). The model has three main components

- i) Data sheets
- ii) Templates (cells with formulas)
- iii) Visual basic procedures.

2.3.1 Data sheets

The main source of data is the sheet All_RO. It merges two data sets from RIV provided by InfoScience. The database All_RO is shaped as a data panel covering years 2010-2013 and a set of RO characteristics, labour input, financing and RIV points.

2.3.2 Distribution to pots

This sheet (DistrToPots) includes two alternatives of the distribution of the PRFS budget to the pots by RO types (Scientific RO – ScRO, RTO, Public services and laboratories - PubL and National resources – NatRes) and evaluation criteria (Excellence, Performance, Societal Relevance, Membership in the world research community, Management) - Figure 3.

Figure 3 Alternative distribution of PRFS budget to the pots.

Basic						Client proposal					
	ScRO	RTO	PubSL	NatRes			ScRO	RTO	PubSL	NatRes	
Research Excellence	10%	5%	5%	5%		Research Excellence	20%	5%	5%	5%	
Research Performance	50%	50%	50%	50%		Research Performan	50%	50%	40%	40%	
Societal Relevance	10%	20%	20%	20%		Societal Relevance	5%	20%	30%	30%	
Membership in the World	10%	5%	5%	5%		Membership in the \	10%	5%	5%	5%	
Management	20%	20%	20%	20%		Management	15%	20%	20%	20%	
Total	100%	100%	100%	100%		Total	100%	100%	100%	100%	
Translates in the weights in the total institutional funding						Translates in the weights in the total institutional funding					
	ScRO	RTO	PubSL	NatRes			ScRO	RTO	PubSL	NatRes	
The share of PRFS	15%	15%	15%	15%		The share of PRFS	15%	15%	15%	15%	
Research Excellence	1.5%	0.75%	0.8%	0.75%		Research Excellence	3.0%	0.75%	0.8%	0.75%	
Research Performance	7.5%	7.5%	7.5%	7.5%		Research Performan	7.5%	7.5%	6.0%	6.0%	
Societal Relevance	1.5%	3.0%	3.0%	3.0%		Societal Relevance	0.8%	3.0%	4.5%	4.5%	
Membership in the World	1.5%	0.8%	0.75%	0.75%		Membership in the \	1.5%	0.8%	0.75%	0.75%	
Management	3.0%	3.0%	3.0%	3.0%		Management	2.3%	3.0%	3.0%	3.0%	

Source: own proposal based on WP7 report

The percentages allocated to each criteria can be understood as weights associated with social priorities (expectations) for each type of research organisations. In this sense we are using these weights for calculating total scores throughout the model. These can be (and actually are) the weights introduced in equation (3). Two lower tables in Figure 3 illustrate the impact of the distribution to pots on the total IF budget. It is obvious that under the assumption of PRFS accounting 15% of IF budget, allocating 5% to a pot will on average impact on the total IF budget of a RO by 0.75% which is rather a marginal effect. Therefore, it is suggested not to use low allocations i.e. less than 5%. It is better to use zero allocation and strengthen other evaluation criteria more relevant to the given RO type.

2.3.3 Simulating evaluation results

To see any effects of the new system it is important to know evaluation results on which the distribution of PRFS budget will be done. Since the only information about the performance of RUs (EvUs) are so called RIV points, we are proposing to use them for generating two alternatives of the initial score setting

- i) Excellence, performance and management scores derived from the RIV points per Active Researcher. The RUs (EvUs) are divided in four (excellence, performance) or three groups (management) based on the RIV points and the scores corresponds to the order of the groups: the group of lowest RIV points per Active Researcher gets score 1 and so on. The maximum score in management is 3.
- ii) The second score setting differs from the first one only in terms of the allocation of the performance score which is based on the absolute value of RIV points per RU (EvU).

In the both cases, the societal relevance and membership in the world research community scores are associated to the RO types (societal relevance: ScR and RTO – 2, PubL-and NatRes-3; membership: ScR – 3, the rest 1)

In addition we consider two testing alternatives iii) all scores equal 2 and iv) all equal 2 but for the best organisation all criteria scores equal 4. The initial setting of evaluation scores is built in the visual basic procedures and cannot be changed without modifying the code. The initial score settings are stored in sheet “EvalRes”.

For the dynamic simulation however, we need scores also for the consequent periods. In the simulation tool we consider maximum three periods of the new institutional funding. To get the evaluation for the next period transition matrices are used. We use deterministic rules which are incorporated in these matrices. The first rule is the total score (using weights from the distribution to pots) of the previous evaluation. We consider four intervals of the total score; each interval will be associated with the other transition matrix. The transition matrices are the second rules for generating the new scores. We offer three alternatives of the sets of transition matrices. Note that stating transition matrices is uneasy job, since we can move the individual scores only ± 1 . It requires experimenting and transition matrices might be still subject of changes. Transition matrices are stored in sheet “defin”. The projections are stored in sheet “Scores_t”.

2.3.4 Note

Please, note that the names of data and template sheets cannot be changed, since they are fixed in the procedures.

2.4 Static simulation

The static simulation is a simulation of the IF distribution in one period of the new funding system in relation to the base period. Only the Method A for distributing PRFS budget among the EvUs is implemented. At the aggregate level of the provider, the template includes the calculation of all components of IF, the distribution of the PRFS to pots by evaluation criteria and RO types deploying the rules described in 2.3.2, the numbers of person-scores (manscores) per RO type and evaluation criteria category and the monetary value of a person-score (MVPS) for each category. The MVPS (in CZK thousands) differ between categories due to the weights achieved scores times active researchers (persons). It is the first indication of the effects of the simulation. The template further contains the characteristics of EvUs, used scores (or transformed scores if this option is selected), weighted scores and individual distributions of the institutional finances.

Ex-ante assessment of the proposed funding system - Draft version for public consultation

The screenshot shows an Excel spreadsheet with various data tables and selection boxes at the top. Three blue arrows point from labels below to specific areas:

- Control scroll boxes**: Points to the top selection boxes for parameters like 'Inst. Fin. Scheme', 'PRFS budget', 'PRFS pot', 'AltSch', 'EvalAlt', 'ExPerf ... RIV', and 'MEYS'.
- PRFS budget in pots**: Points to the 'New IF Budget' table, which includes columns for Block, PerfAgr, PRFS, and pots.
- MVPS**: Points to the 'PRFS per ActiveRes' table, which shows PRFS values per ActiveRes for different categories.

On the top of the sheet, there are five selection (scroll) boxes controlling (setting parameters of) a simulation. In addition there is a scroll box for downloading a data set of a new provider (e.g. MEYS, MoA, MHealth etc.) from the data sheet “RO_all”.

The considered scenario parameters (controls) are

- i) **IF scheme**, i.e. the choice between the **scheme** with **85%** of the previous budget being allocated to Block and PA funding, and the alternative reducing this allocation to only **60%**. Of course, the alternatives can be extended, the new schemes must be introduced in e “defin” sheet.
- ii) **PRFS budget change** offering an increase or a decrease by 5% or staying the same.
- iii) **PRFS pot distribution**: two schemes are available Basic and Alternative 1 – see 2.3.2
- iv) **Alternative Initial Evaluation Setting** (see 2.3.3)
 - a. Ex&Perf ... RIVPoints/FTE
 - b. Perf ... abs RIV points
 - c. Fixed
 - d. Fixed low, one EvU on max
- v) **Score transformation method** which allow for transforming score by powering them by 1.5 or 2. It prefers those who are more successful.

The results area further analysed in “Chart_all” sheet. There are several graphs illustrating the IF distributional changes produced by the selected scenario.

2.5 Dynamic simulation

In contrast, the dynamic simulation enables to analyse impacts of the both PRFS distribution method; the method A and the method B in two modes. The dynamic simulation calculates the development of the IF for three consequent periods. The drivers of changes are PRFS budget increases, recursive development of labour (Active Researchers) depending on the previous IF budget and evaluation projections.

The dynamic simulation is actually the main instrument for assessing the effects of IF scenarios. The scenarios are defined by the same set of parameters i) to v) mentioned in the paragraph on the static simulation extended of

- i) The choice of **transition matrices** for projecting the development of scores
- ii) **The R&D budget growth rate** in the transitional period (from 2015 until the time when the new scheme is supposed to start (2020))
- iii) **Selection of the PRFS methodology**: A –based on person scores, B –based on the departure of a RO (EvU) from the average of the evaluation criteria in a RO type category; B is further divide in four approaches – 1 or

Ex-ante assessment of the proposed funding system - Draft version for public consultation

- 2 referring to the use of the relative distance or the use of intervals of the distance (see Section 2.1.2) and (a) and (b) referring to the level of the budget decision, i.e. RO or EvU.
- iv) The choice of **the recalculation method** of IF budget allocations to ROs into IF budget servicing of areas of sciences (6 main FOS and 36 more detailed areas of sciences – 3digit FOS). In the data we have two dominant 3digit FOS per each EvU, accounting usually together between 60 and 100%. One option is to allocate to the 3digit FOS only the actual shares or to distribute the whole IF budget of each EvU over these two shares.

Ex-ante assessment of the proposed funding system - Draft version for public consultation

Figure 5 Dynamic simulation control parameters

<

Name of the scenario

Number (order) of the scenario

PRFS methodology

Ex-ante assessment of the proposed funding system - Draft version for public consultation

Figure 6 An example of scenarios

		Basic Scheme						Alternative Scheme (a)					
		Distribution to Pots:						Distribution to Pots:					
		ScRO: Excellence = 0.1; Performance = 0.5; Soc. Relevance = 0.1; Membership = 0.1; Management = 0.2 RTO: Excellence = 0.05; Performance = 0.5; Soc. Relevance = 0.2; Membership = 0.05; Management = 0.2 PubSL: Excellence = 0; Performance = 0.5; Soc. Relevance = 0.25; Membership = 0.05; Management = 0.2 NatRes: Excellence = 0.05; Performance = 0.5; Soc. Relevance = 0.2; Membership = 0.05; Management = 0.2						ScRO: Excellence = 0.2; Performance = 0.3; Soc. Relevance = 0.15; Membership = 0.15; Management = 0.2 RTO: Excellence = 0; Performance = 0.5; Soc. Relevance = 0.2; Membership = 0.1; Management = 0.2 PubSL: Excellence = 0; Performance = 0.5; Soc. Relevance = 0.25; Membership = 0.05; Management = 0.2 NatRes: Excellence = 0; Performance = 0.5; Soc. Relevance = 0.3; Membership = 0; Management = 0.2					
		Institutional Funding Structure Block = 80%, PA = 5%, PRFS = 15%			Institutional Funding Structure Block = 50%, PA = 10%, PRFS = 40%			Institutional Funding Structure Block = 80%, PA = 5%, PRFS = 15%			Institutional Funding Structure Block = 50%, PA = 10%, PRFS = 40%		
		Emphasis on Excellence	Emphasis on Performance	Emphasis on Societal Impact	Emphasis on Excellence	Emphasis on Performance	Emphasis on Societal Impact	Emphasis on Excellence	Emphasis on Performance	Emphasis on Societal Impact	Emphasis on Excellence	Emphasis on Performance	Emphasis on Societal Impact
PRFS Method: PersonScores	Period-1 (2020-2025)	P1EX80B	P1PE80B	P1SO80B	P1EX50B	P1PE50B	P1SO50B	aP1EX80B	aP1PE80B	aP1SO80B	aP1EX50B	aP1PE50B	aP1SO50B
	Period-2 (2025-2030)	P2EX80B	P2PE80B	P2SO80B	P2EX50B	P2PE50B	P2SO50B	aP2EX80B	aP2PE80B	aP2SO80B	aP2EX50B	aP2PE50B	aP2SO50B
	Period-3 (2030-2035)	P3EX80B	P3PE80B	P3SO80B	P3EX50B	P3PE50B	P3SO50B	aP3EX80B	aP3PE80B	aP3SO80B	aP3EX50B	aP3PE50B	aP3SO50B
PRFS Method: Relative Deviation Scores	Period-1 (2020-2025)	B1aP1EX80B	B1aP1PE80B	B1aP1SO80B	B1aP1EX50B	B1aP1PE50B	B1aP1SO50B	B1aaP1EX80B	B1aaP1PE80B	B1aaP1SO80B	B1aaP1EX50B	B1aaP1PE50B	B1aaP1SO50B
	Period-2 (2025-2030)	B1aP2EX80B	B1aP2PE80B	B1aP2SO80B	B1aP2EX50B	B1aP2PE50B	B1aP2SO50B	B1aaP2EX80B	B1aaP2PE80B	B1aaP2SO80B	B1aaP2EX50B	B1aaP2PE50B	B1aaP2SO50B
	Period-3 (2030-2035)	B1aP3EX80B	B1aP3PE80B	B1aP3SO80B	B1aP3EX50B	B1aP3PE50B	B1aP3SO50B	B1aaP3EX80B	B1aaP3PE80B	B1aaP3SO80B	B1aaP3EX50B	B1aaP3PE50B	B1aaP3SO50B
PRFS Method: Mean±SD: within= ±5%; outside=±10%	Period-1 (2020-2025)	B2aP1EX80B	B2aP1PE80B	B2aP1SO80B	B2aP1EX50B	B2aP1PE50B	B2aP1SO50B	B2aaP1EX80B	B2aaP1PE80B	B2aaP1SO80B	B2aaP1EX50B	B2aaP1PE50B	B2aaP1SO50B
	Period-2 (2025-2030)	B2aP2EX80B	B2aP2PE80B	B2aP2SO80B	B2aP2EX50B	B2aP2PE50B	B2aP2SO50B	B2aaP2EX80B	B2aaP2PE80B	B2aaP2SO80B	B2aaP2EX50B	B2aaP2PE50B	B2aaP2SO50B
	Period-3 (2030-2035)	B2aP3EX80B	B2aP3PE80B	B2aP3SO80B	B2aP3EX50B	B2aP3PE50B	B2aP3SO50B	B2aaP3EX80B	B2aaP3PE80B	B2aaP3SO80B	B2aaP3EX50B	B2aaP3PE50B	B2aaP3SO50B

Dimension 1

Dimension 2

Dimension 4

Dimension 3

Dimension 5

Ex-ante assessment of the proposed funding system - Draft version for public consultation

The simulation is fully programmed in Visual Basic (the routine SimIF, calling ScoreProj, DynProj and DynFOS subroutines). Each change of parameters calls the routine SimIF and hence the scenario is updated.

Up to 5 scenarios can be stored (sheets Sim1 to Sim5 are generated). If the same number is used in a simulation run as in the previous run, the simulation (sheet) will be replaced. The scenarios can be named (cell E9 in the Dynamic_all sheet, placed in cell C31 in the Sim_ sheets).

Storing scenarios allow for creating more complex scenarios differing in more than one parameter setting. Scenario parameters are displayed in rows 30 and 31 of the Sim_ sheets. The simulation results are stored starting row 32 in the Sim_ sheets.

Up to 3 scenarios (of 5 stored) can be compared in the SimRes_EvU sheet. The comparison is controlled by scroll-boxes in the row 3 (period in which the comparison will happen, scenarios to be compared, variables/IF-component to be compared/displayed and the comparison base i.e. Total IF or PRFS).

2.6 Visualisation of results

While the overall budget for IF will not be affected by the proposed methodology, the effects of the new IF system are distributional i.e. some ROs might benefit and some might lose. In order to enable an easy analysis of the distributional effect we prepared a visualisation tool developed in Java script. It is available as a web application. The tool is built upon a collection of scenario-model runs. The user by clicking on the buttons selects scenarios and sees the effects in the chart on the screen.

The mechanism of visualization is known as a pack layout. The smaller circles (leafs) represent the research fields (RF). The surface area (size) of the RFs is a function of IF distribution according to a particular scenario. By default, the size of RFs reflects the distribution of IF budget in 2019. The circles are fully comparable at this level and are sorted in descending order following a spiral path. RFs are further nested within the research areas (RA). While the RFs are comparable within and also across the RAs, the larger circles representing the RAs are not mutually comparable. They are correctly sorted in descending order according to the sum of respective RFs; nevertheless, the size of the larger circles depends not only on the aggregation of the RFs but also on a space used by the smaller circles. The degree of a wasted space is different across the RAs and is related to a number of smaller circles (RFs) and their circle size variability. This is a prize for more illustrative hierarchy description and transition features compared to other competitive layouts (e.g. a treemap). The actual amount of IF (in thousands CZK) can be obtained as a mouse-over tooltip for a given RF. Moreover, the zoom function is also available for the main window.

Each RF is described by an acronym which is equivalent to the long field classification used for the IPN Metodika project. Few fields are not included in the visualization because of its marginal role. For simplicity, the present simulation is based on assumption of max. 2 RFs within a given RO. This assumption is quite restrictive but can be easily relaxed if necessary. Before clicking the update buttons, one could consult the detailed legend by clicking on the link situated above the buttons at the top of the page. The legend describes values of all parameters described elsewhere. The combination of all their values results in $2 \times 2 \times 3 \times 3 \times 3 = 108$ buttons representing IF scenarios. The darker the button's colour, the lower the correlation with the baseline value and, thus, the higher degree of transitions in order at both RA and RF levels.

3. Scenarios

A set of external conditions and internal parameters is called “scenario”. The terms external/internal refer to the institutional financing approach: i) internal are parameters of the IF methodology and ii) external are the parameters of the implementation conditions including the evaluation results. Obviously, we want scenarios that represent either options of the institutional financing (we alternate parameters of the institutional financing) or implementation paths of the selected IF option (we alternate external conditions). The latter scenarios can be particularly used for the sensitivity analysis.

An example of scenarios is presented in Figure 6, above. The figure represents a five dimensional matrix. The first dimension alternates the distribution of the PRFS budget into pots by RO types and evaluation criteria (policy priorities) (see 2.3.2). The second dimension refers to the institutional funding structure i.e. the shares of block, performance agreement (PA) and PRFS funding on the total IF (see 2.4 i)). Two alternatives are considered. From the decision making point of view these two dimensions should be switched in the order. These first three dimensions refer to the internal (IF) parameter setting. The fourth dimension refers to the development of evaluation results over time i.e. to the selection of transition matrices (see 2.3.3, the last paragraph). The fifth dimension refers to time – we consider three consequent periods.

In fact there are further parameters which have to be set before calculating the scenarios too and which are common for all the above scenarios. These parameters include the growth rates of the PRFS budget, selection of the initial evaluation of EvUs’ performance, etc.; these can also be alternate and thus used for scenario definitions.

4. Results of the simulations

4.1 Investigated issues

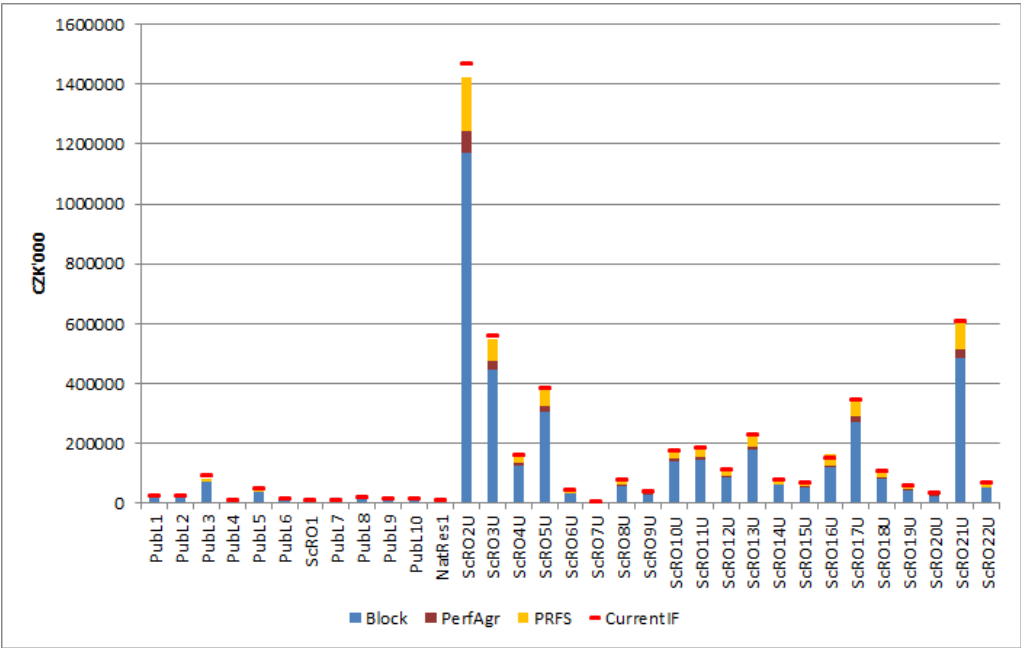
The purpose of building the model stated in the terms of reference is to assess the impact of the new system of institutional funding of ROs and to assess the robustness of the proposed ex-ante assessment method through sensitivity analysis. In this section we present and analyse some issues that popped up during the design of the method:

- i) While so called RIV points incorporate the two aspects necessary for the distribution of IF, i.e. the quality of research performance and the size of the evaluated entity, the scores provided by the new evaluation process will lack the size dimension. This is because the current system rests largely on collecting research results, translating quantity in quality by associating outputs with values (points) in each output category. The new system is purely qualitative, quantitative indicators only feed into qualitative judgements. The qualitative judgements are appraised by panels giving marks (scores 0 to 4). The report on the IF methodology addresses the need for “size” in two ways: A – using scientific staff (active researchers, AR) as the measurement of size relevant to IF; and B – accepting the base year institutional financing as the measurement of size. (see Chapters 1 and 2 and WP7 report for more details)
- ii) Using scientific staff (approach A) is not without problems due to
 - a. Lack of reliable information on it (solutions are proposed in the WP7 report)
 - b. It might carry with it unpleasant effects that high figures of scientific staff can outweigh poor performance.

- c. The different notion of size in the current methodology and the proposed approach A will necessary generate effects similar to (b.).
- iii) The range of scientific quality differentiation is much larger using RIV points (for example RIV points per active researcher (RIVpt/AR) range from 4 to 432 in the set of ROs under the IF umbrella of MEYS, while the maximum range of evaluation scores is 0 to 4, realistically between 1 and 4. As mentioned earlier, one option how to address it is to use non-linear transformation favouring better performances.
- iv) The distribution of the PRFS budget into pots (2.3.2) is not a business of the “Metodika” team. It should be decided by policy makers based on R&D policy objectives and an analysis conducted for this purpose. We are however considering three options, to indicate the sensitivity of the final distribution of IF (PRFS) to different distributions to pots (for the justification of the proposed distribution alternatives see the WP7 Report).

In order to demonstrate the above effects we avoid assuming any growth of the IF and PRFS budgets during the investigated periods in our analysis. We use almost exclusively the basic scheme for the division of the IF components: Block IF 80%, PA 5% and PRFS 15%.

Figure 7 Institutional Funding given by Approach A: single provider



Note: evaluation derived from RIV points per AR.

Source: model results

4.2 The size effect in Approach A

4.2.1 The roots of the problem

We focused our analysis on the ROs funded by the MEYS. The ROs are anonymised in order to avoid readers' concentration on evaluation results which are developed purely for the testing of the system and do not constitute predictions.

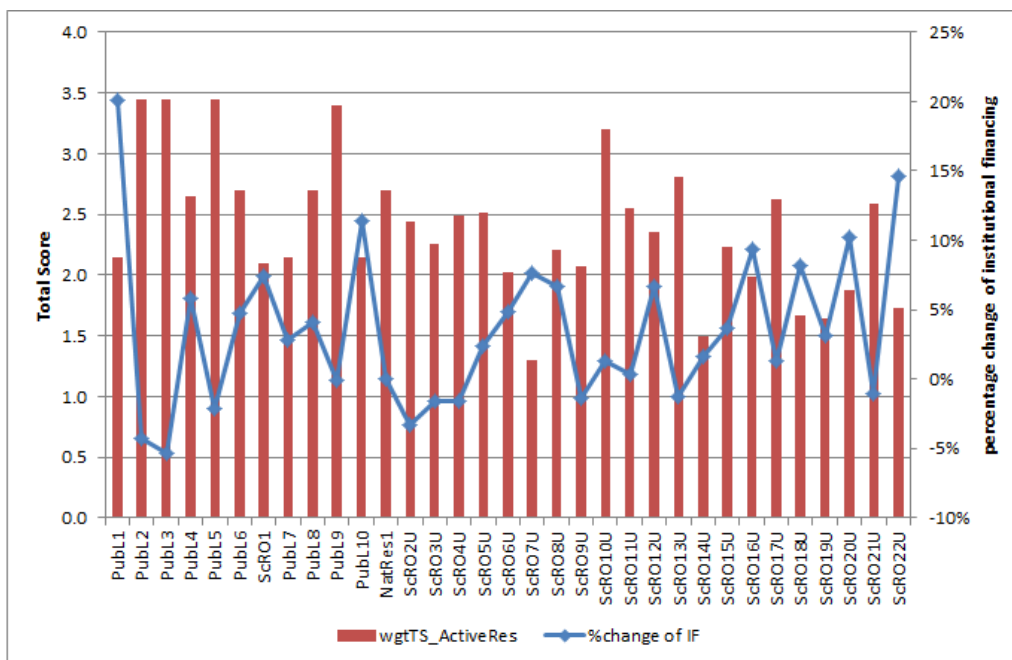
The sample includes ROs of various sizes and of three types: scientific research organisations (1 research institute and 21 universities), public service ROs (11) and a national resource/infrastructure RO (1).

The resolution of Figure 7, above, is not fine enough to show the budget changes between the base year scenario (the current methodology) and the proposed scenario (new methodology – approach A), except for the drop of total IF for the two largest universities.

A better insight is given in the chart below (Figure 8). It is clear that there are some unexpected distributional effects. The “PubL1” gains markedly (20% in terms of total IF) while its evaluation score is rather average (2.2) while the ROs “PubL2” and “PubL3” lose 4 and 5 per cent respectively with the top total score (3.5).

We can find similar contrasting cases among the universities, too: average performing universities (with the scores about 2.4) “ScRO2U” – “ScRO4U” lose from -3 to -2 percent of total IF, while the badly performing university “ScRO7U” (the total score 1.3) gains 8% on total IF.

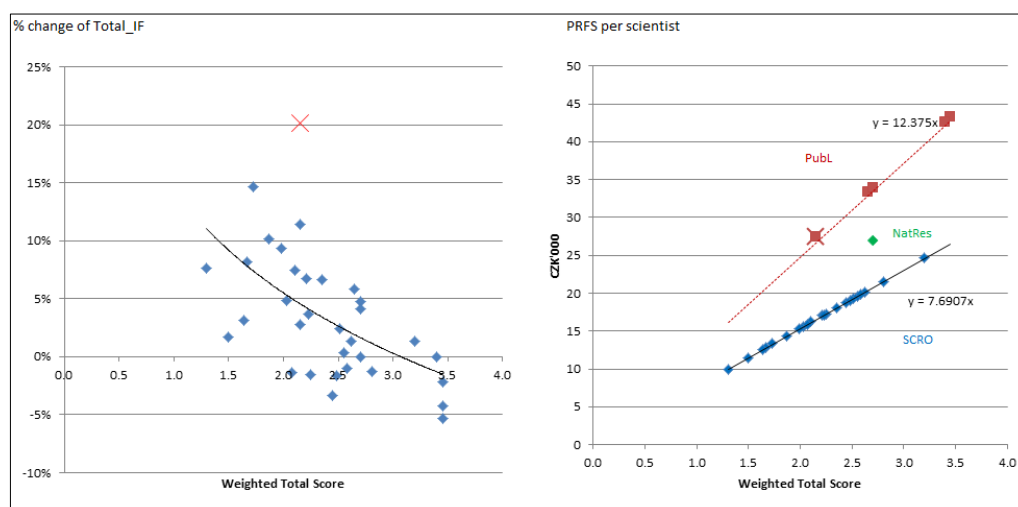
Figure 8 Total (average) scores and percentage change of total IF



Note: Total score: scores weighted by the “pot weights” and by active researchers within the ROs with several EvUs. The affix “U” in the RO name indicates that the RO is university. Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; linear transformation of scores; evaluation alternative: scores proportional to RIV/AR; It can be shown that these strange effects can also be observed for other evaluation score alternatives.

Ex-ante assessment of the proposed funding system - Draft version for public consultation

Figure 9 the relationship between the evaluation scores (Total Score) and PRFS allocations



Note: Total score: scores weighted by the “pot weights” and by active researchers within the ROs with several EvUs. Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; linear transformation of scores; evaluation alternative: scores proportional to RIV/AR;

In the above figure (Figure 9) we present some further details on the relationship between the scores and the allocations of institutional financing.

First, we concentrate on the distribution of PRFS funds, since the block and PA components are predetermined as 85% of the base year IF.

In the right chart of Figure 9 we see that PRFS funds per AR (active researcher) are well proportional to the total score. But it is also evident that scientific ROs get less per an AR than public service RO (PubL), in absolute terms and in terms of the gain per score (the slopes 7.691 and 12.375 respectively, which means that ScROs get CZK 7691 and PubL get CZK 12375 per AR and one score). This may be due to some historical reasons, but likely it is more due to the fact that our estimates of AR refer to head counts and not to FTE; in the case of public service ROs one can expect that head counts are close to FTE while for universities head counts might be even twice or more higher than FTE.

The left chart in Figure 9 illustrates the relationship between the results of ROs evaluations (total score) and the changes of institutional funding. We use total IF because in the current system (2010-2013) there is no unique division of IF into PRFS and the other components. The surprising thing is that the percentage change of IF declines with the increase of the evaluation scores (although these were derived from RIV points). The change becomes even negative in a number of cases. This downward sloping relationship (which is nonlinear with increasing slope, thus eventually reaching 0) is the result of the interplay of at least four factors:

- i) Those who are evaluated high collected also a large number of points in the past thus got high IF and hence gain little or nothing from the new system.
- ii) Who concentrated too much on research output might omit the other aspects of good governance and performance and will even lose in the new evaluation and IF methodology. Consequently gets less institutional finances in the new system.

- iii) The broad range of RIV points (actually unlimited) will translate into only a narrow range between 0 and 4 in the proposed evaluation methodology. Thus some organisations simply cannot fully utilise their advantages in producing research outputs; [ceiling given by the maximum score (4)].
- iv) The ROs with low intensity of RIV points (i.e. low RIV/AR) will gain when even low scores of their narrow range are assigned to all active researchers; [different implementation of size criteria in the financing methodology].

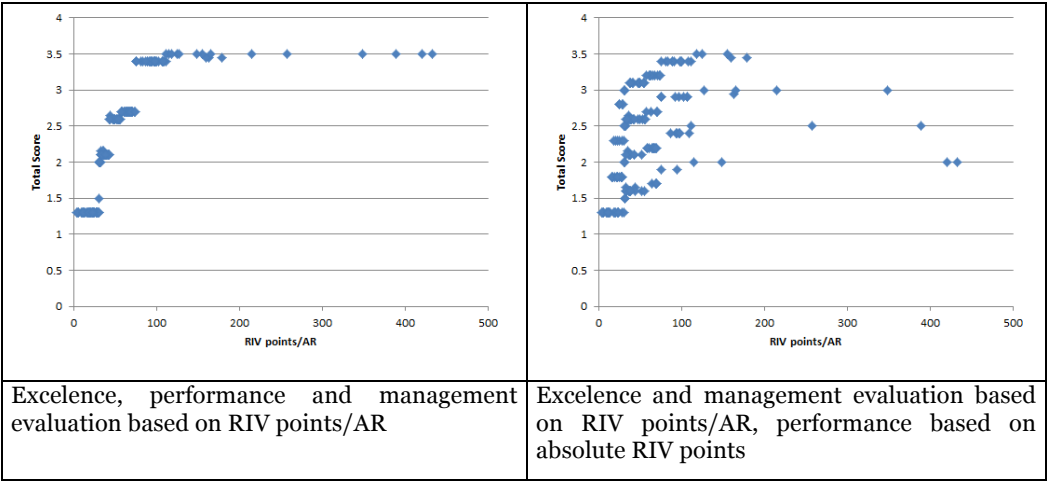
Because the budget is limited, in order someone to gain some other must lose. Those who gain little in the evaluation might even turn into a loser.

The problem iii) is well illustrated in Figure 10, below. In both cases, only 10% of ROs can get score 4 for Excellence, while for Performance it is 25%. The other criteria are limited to a score of 3; no RO has 0 in any evaluation criteria.

In spite of these specificities, the chart illustrates a common issue with the narrow range and score ceiling. ROs with high RIV intensity (RIV points/AR) that are at the ceiling or below will experience a necessary loss in institutional funding in the following sense: an RO with 114 RIV points per AR will get a Total Score of 3.5 similar to an RO with the intensity of 432 RIV points per AR and thus, both will get the same PRFS funding per AR.

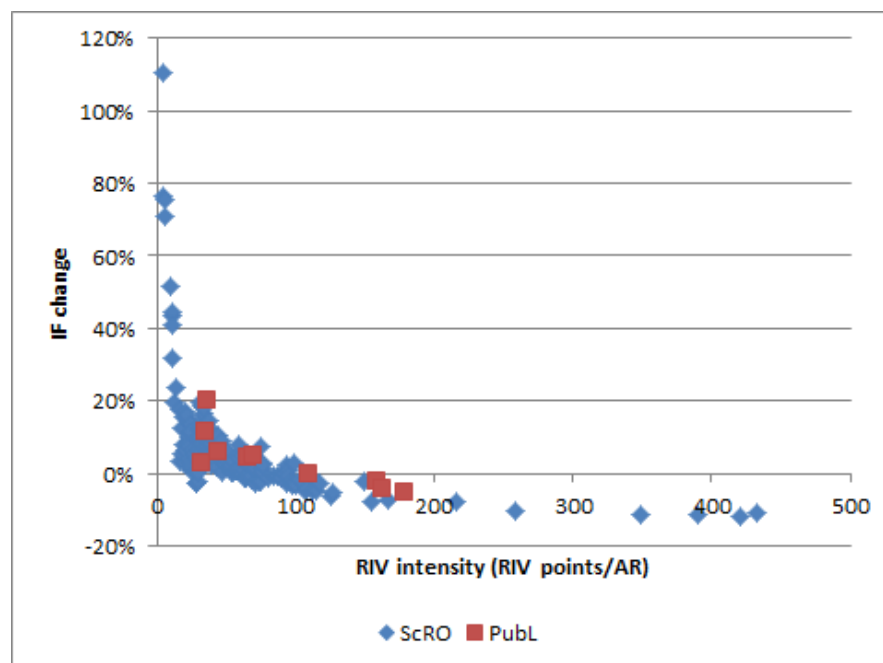
In addition, if the first RO (114 RIV points per AR) is bigger than the other one, the first one will earn more than the other. In relative terms, the first RO might increase its IF budget while the other will likely lose. To reduce this effect, the evaluation should differentiate the ROs as much as possible; the top score should be scarce. Nonlinear transformation might also help (it expands the range of scores).

Figure 10 The relationship between RIV points intensity (RIV points/AR) and the Total Score resulting from the new evaluation methodology.



The size effect is associated with the output intensity in terms of RIV points/AR (we will call it RIV intensity). If the RIV intensity is low, the gains thanks to the new methodology are high. The more the RIV intensity increases, the higher the percentage increase in IF budget decline, eventually resulting in a loss (Figure 11).

Figure 11 The output intensity and IF change.



Note: Total score: scores weighted by the “pot weights” and by active researchers within the ROs with several EvUs. Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; linear transformation of scores; evaluation alternative: scores proportional to RIV/AR;

Low RIV intensity means that a relatively large number of researchers produce low number or value of outputs. In this case, there is the bottom effect when the evaluation scores (Total score) do not drop under a certain level. In our example it is 1.3; there are 45 EvUs lying on the bottom. Lot of them thus get more person-scores than it would be equivalent to the RIV points and consequently get PRFS budget well exceeding the 15% of the base year IF, which leads to the IF increase.

A similar effect can happen also for larger total scores if the original output intensity is relatively low. It has a lot to do with our categorisation of RIV point in scores, but it can realistically happen that organisations with different RIV intensity will reach similar scores in the new evaluation.

We can guess that increases for more than 15% of the base year IF are due to the intensity-size effect. Table 2 illustrates the extent of the intensity-size issue. About 12% of ScRO and 10% of public laboratories increase their IF by more than 15%, 3% of ScRO even by 50%. These increases are compensated by decreases (often marginal) in a number of EvUs.

Table 2 IF changes, number of cases (EvUs) in various categories of significance.

	ScRO	PubL
Number of EvUs	169	10
Increase by more than 15%	12%	10%
Increase by more than 50%	3%	0%
Decrease	27%	40%

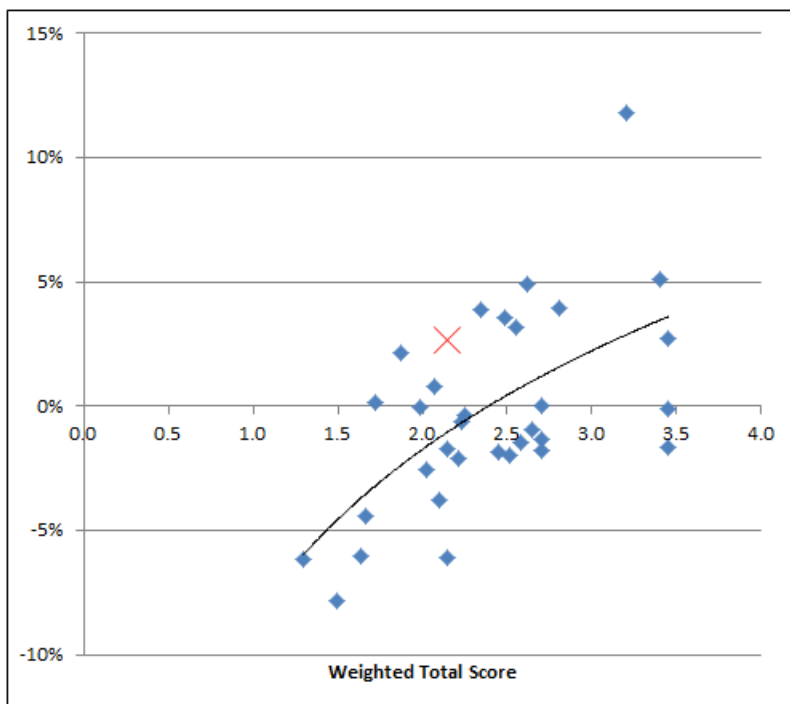
Note: Total score: scores weighted by the “pot weights” and by active researchers within the ROs with several EvUs. Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; linear transformation of scores; evaluation alternative: scores proportional to RIV/AR;

4.2.2 An option to improve Approach A: Non-linear transformation of evaluation scores.

Non-linear transformation of evaluation scores can address the problem of insufficient differentiation of ROs in the funding methodology – Approach A. As is shown in Figure 12, the quartic transformation will turn the relationship between total score and the IF change upward sloping, i.e. the IF change increases with the scores.

The quartic transformation has the capacity to reduce the low output intensity – size effect effectively as it is shown in Table 3. However, it is important to stress that the transformation will not eliminate the effects of bottoms and ceilings in the new evaluation system.

Figure 12 Percentage change of Total IF, quartic transformation



Note: Total score: scores weighted by the “pot weights” and by active researchers within the ROs with several EvUs. Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; quartic transformation of scores; evaluation alternative: scores proportional to RIV/AR;

Ex-ante assessment of the proposed funding system - Draft version for public consultation

Table 3 The benefit of quartic transformation of scores

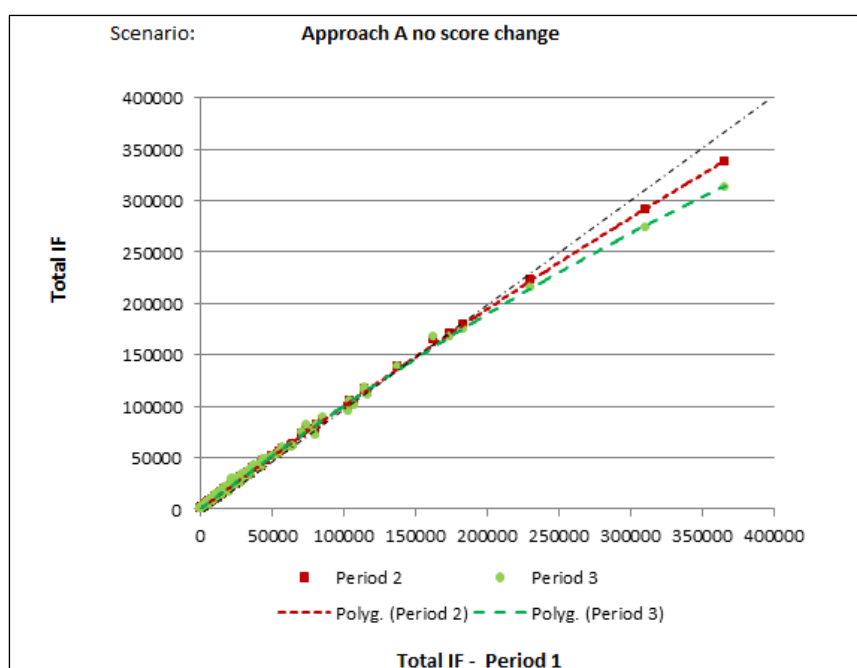
	RO	Total Score	Total Quartic Score	IF change	
				Linear T	Quartic T
Moderates penalisation	PubL3	3.5	173	-5%	-2%
	PubL2	3.5	173	-4%	0%
	ScRO2U	2.4	72	-3%	-2%
Rather neutral	ScRO21U	2.6	67	-1%	-1%
	PubL9	3.4	165	0%	5%
	ScRO11U	2.5	79	0%	3%
Offsets unexpected improvements	PubL10	2.2	28	11%	-2%
	ScRO22U	1.7	18	15%	0%
	PubL1	2.2	28	20%	3%

4.2.3 Approach A from the dynamic perspective

The question is whether the above properties of Approach A vanish when the financing goes from the period when PRFS has already been allocated to using the results of the new evaluation methodology i.e. from Period 1 to Period 2.

In order to show the net effect of Approach A we do not assume any changes of scores between periods (from Period 1 to Period 2 and from Period 2 to Period 3). The only factor driving the dynamic changes is subjecting 15% of the previous budget to the reallocation using Approach A.

Figure 13 IF distributions in Period 2 and Period 3 relatively to IF allocations in Period 1.



Note: The level of EvUs; Total score: scores weighted by the “pot weights”; Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; linear transformation of scores; evaluation alternative: scores proportional to RIV/AR; no dynamic changes of scores.

Figure 13, above, shows that even under these conditions the property of Approach A, i.e. favouring small beneficiaries and penalising the large ones, persists also in the transitions between periods when the new methodology has been applied (simulated). It has also been shown that allowing 40% of IF to be allocated through the PRFS will not help; it might even lead to larger departures.

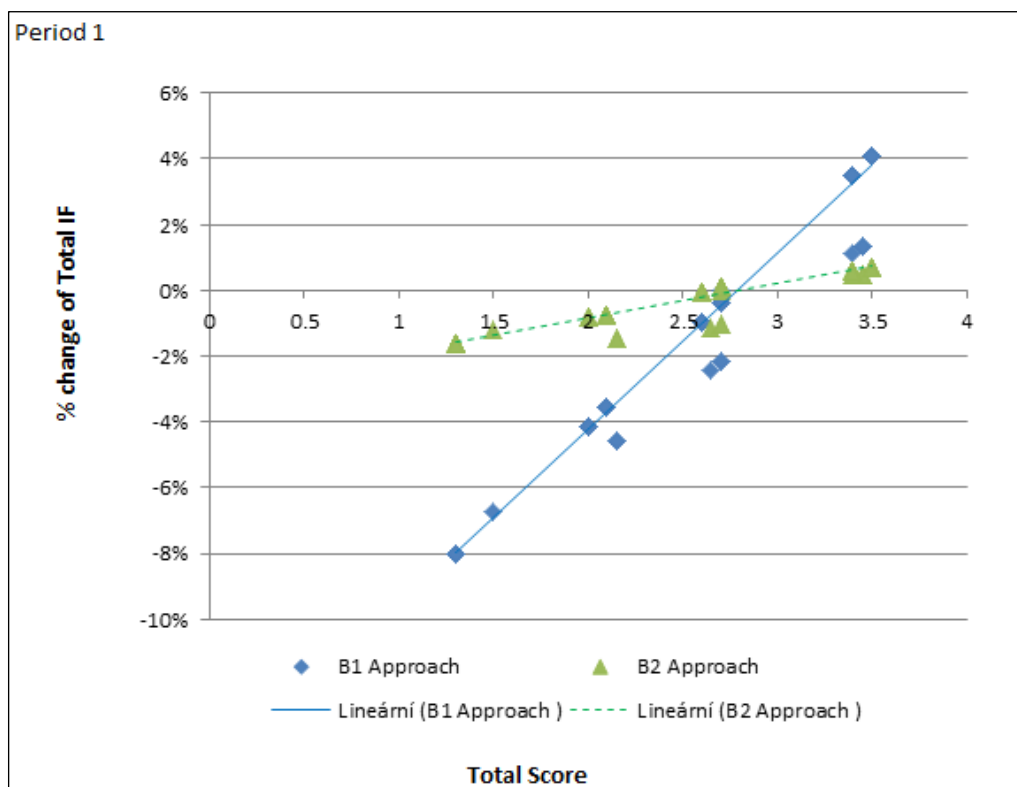
4.3 Approach B

The mode of Approach B (see 2.1.2) does not differ substantially from Approach A; they both follow quite closely the distribution of the IF in the base period.

The departures from the base year IF range from -8% to 4 % for Approach B1 and from -1.6% to 0.7% for Approach B2 in the first transition (Figure 14).

The relationship between the changes in Total Score and IF is more or less linear. Thus we can say that B2 is a moderate version of B1 in the current implementation; definitely B2 can be made more radical.

Figure 14 The relationship between evaluation scores and % change of IF in Approach B in the first period

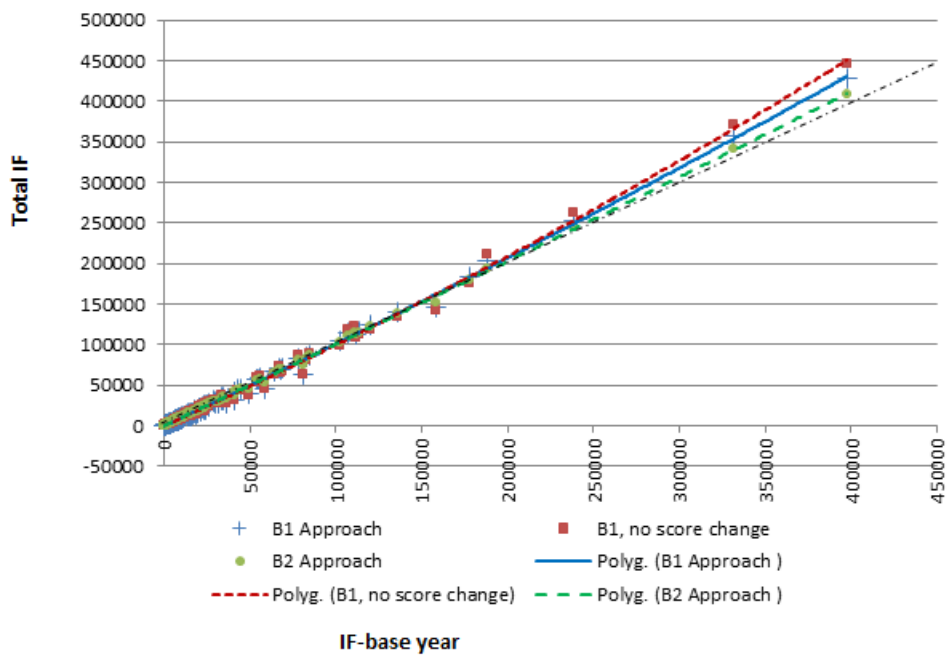


Note: The level of EvUs; Total score: scores weighted by the “pot weights”;. Scenario: IF components [80%, 5%, 15%]; Basic scheme for distr. to pots; Linear transformation of scores; Evaluation alternative: scores proportional to RIV/AR.

The obvious disadvantage of Approach B is that it conserves the current situation in the distribution of IF. This is well illustrated in Figure 15, showing that the redistributions are marginal after three consequent evaluation and financing periods.

It is also evident that Approach B favours large beneficiaries of the current IF. We included a scenario with no changes in evaluations between periods for the Approach B1 (red line). The fact that it departs from the black dotted line more than the blue line of the B1 scenario with inter-temporal evaluation changes, suggests that our evaluation projection narrows the range of evaluation results.

Figure 15 The changes of IF after three evaluation and financing periods



4.3.1 Distribution to pots

Evidently, the distribution of PRFS into pots by RO types and evaluation criteria (social preferences) inevitably affects the distribution of institutional funding.

In the analysis in this chapter we consider three scenarios of such distribution (Basic, Client proposed and Radical) and the two IF methods: Approach A and Approach B1. The distribution to pots scenarios are given in Table 4.

The effects of these scenarios are illustrated by comparing Client and Radical distribution to pots scenarios with the basic scenario for each method, in Period 1 and in Period 3. The comparison is done in terms of percentage change. The results are placed in Table 5.

Table 5 shows that in some cases the differences can be substantial: for some organisations the Total IF can differ by up to 24% in the third period due to different social priorities in the scenarios for the distribution to the pots.

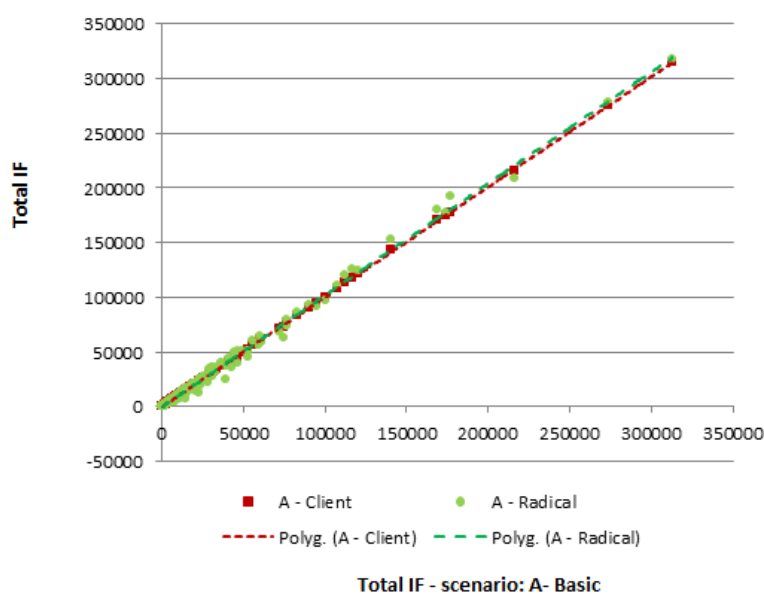
On the other hand, there are no unexpected shifts - even for Approach A. The Total IF distributions are closely correlated (Figure 16).

Ex-ante assessment of the proposed funding system - Draft version for public consultation

Table 4 “Distribution to pots” scenarios

Basic	ScRO	RTO	PubSL	NatRes
Research Excellence	10%	5%	5%	5%
Research Performance	50%	50%	50%	50%
Societal Relevance	10%	20%	20%	20%
Membership in the World Research Community	10%	5%	5%	5%
Management	20%	20%	20%	20%
Total	100%	100%	100%	100%
Client proposal	ScRO	RTO	PubSL	NatRes
Research Excellence	20%	5%	5%	5%
Research Performance	50%	50%	40%	40%
Societal Relevance	5%	20%	30%	30%
Membership in the World Research Community	10%	5%	5%	5%
Management	15%	20%	20%	20%
Total	100%	100%	100%	100%
Radical	ScRO	RTO	PubSL	NatRes
Research Excellence	70%	5%	0%	0%
Research Performance	10%	10%	15%	15%
Societal Relevance	5%	70%	70%	70%
Membership in the World Research Community	5%	5%	5%	5%
Management	10%	10%	10%	10%
Total	100%	100%	100%	100%

Figure 16 The relationship between the “distribution to pots” scenarios in terms of Total IF. Approach A.



Ex-ante assessment of the proposed funding system - Draft version for public consultation

Table 5 The effect of distribution to pots on Total IF in different scenarios

	Period 1 A - Client	Period 1 A - Radical	Period 3 A - Client	Period 3 A - Radical
PubL1	1%	6%	1%	4%
PubL2	0%	-1%	0%	-2%
UFac1	-1%	-6%	0%	-18%
UFac2	-2%	-2%	-1%	-12%
Min	-3%	-8%	-2%	-24%
Max	1%	6%	1%	6%
	Period 1 B1- Client	Period 1 B1 - Radical	Period 3 B1 - Client	Period 3 B1 - Radical
PubL1	1%	3%	1%	4%
PubL2	0%	-1%	0%	-1%
UFac1	-1%	-4%	0%	-11%
UFac2	0%	-1%	0%	-3%
Min	-1%	-4%	0%	-11%
Max	1%	6%	1%	6%

Note: For A approach, % changes are calculated in respect to A – Basic within each period; for B1 approach, % changes are calculated in respect to B1 – Basic within each period.

4.4 Conclusions

Approach A has the capacity to address some weaknesses of the previous system. However, the right figures on scientific labour are needed, otherwise poor performers will gain compared to the previous funding system. Approach A can be improved by using nonlinear transformation of scores, however it must be tailored to the actual situation.

Approach B, in contrast, can well appreciate good performance and penalises poor performers. The only problem is that it might start from the bad base. Also, Approach B is less sensitive to the distribution of pots. This may be an advantage at the beginning of the new system; however, later it might slow down or even prevent some changes.

Approach B is easy to implement while Approach A will require substantial fine-tuning, which in return might allow for higher flexibility. For fine-tuning, model simulations are necessary which deploy good data (otherwise garbage in, garbage out)

technopolis|group|

In collaboration with

NIFU

Nordic Institute for Studies in
Innovation, Research and Education

