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EQUALITY, INFANCY AND EFFICIENCY

IN ALLOCATING INTERNAL RESEARCH FUNDS TO FACULTY MEMBERS

by

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EQUALITY, INFANCY AND EFFICIENCY
IN ALLOCATING INTERNAL RESEARCH FUNDS TO FACULTY MEMBERS

I. Introduction

This policy paper deals with the annual allocation of faculty funds to academic staff members for supporting research related activities such as conference attendance, subscription to journals, submission of papers to refereed journals charging fees, purchase of software, etc.

Equal allocation is a computationally convenient scheme and is also likely to be supported by a blocking coalition of faculty members when research performance is unequally non-symmetrically distributed with a mode and a median that are significantly smaller than the mean. Unsurprisingly, equal allocation is frequently applied in allocating internal funds among faculty members for supporting the aforementioned research related activities.

However, equal allocation presents no consideration for efficiency and does not provide desirable signals to faculty members. (See also Levy, 1993.) When the budget is small, it insufficiently rewards devoted, productive researchers and excessively rewards non devoted, or unsuccessful, faculty members.

Based on the principles of:

Equality - a lump-sum portion and open access,
Infancy - support for new starters, and
Efficiency - research output's quality, quantity and share

(abbreviated EIE) an EIE research-fund-allocation scheme is constructed and proposed in the following sections. Section II presents the EIE allocation scheme. Section III incorporates a fix degree of inequality aversion into the EIE allocation scheme. Section IV proposes a formula for computing members' research output scores that takes into account quality, quantity and contribution aspects. Section V recommends.

II. An EIE Allocation Scheme

The proposed EIE allocation scheme employs the following notations:

i, i' = faculty academic staff member indexes, $i, i' = 1,2,3,\ldots, M$, where M is the number of the faculty academic staff members;

X_i = the research output score of the i-th academic staff member during the last period of years;

D_i = a dummy variable indicating whether the i-th academic staff member is a new starter (1) or veteran (0);

Y_i = the annual fund allocated to the i-th academic staff member by the faculty;

B = the faculty budget for supporting academic staff members' research oriented travels, subscription, purchase of research related items, etc.;

a = an equal annual lump sum allocated by the faculty to all academic staff members regardless of performance and their research experience;

b = an additional equal annual lump sum allocated by the faculty to new starters; and

g = the nominal value of a point in the publication score (that is, the amount of fund given by the faculty for a point of X).

It is proposed that the allocation of faculty funds to individual members will include a general lump sum, an exclusive lump sum supplement to new starters, and a variable portion that awards members in accordance with their research output over the last period of years:

$$Y_i = a + bD_i + gX_i . \tag{1}$$

By substituting Eq. (1) into the budget constraint

$$\sum_{i=1}^{M} Y_i = B \tag{2}$$

the nominal value of a point in the research-output score index can be expressed as

$$g = \frac{B - aM - b\sum_{i=1}^{M} D_i}{\sum_{i=1}^{M} X_i} . \tag{3}$$

By substituting Eq. (3) into Eq. (1), the proposed formula for allocating annual faculty fund to academic staff members is rendered as a combination of a general lump sum, a new-starter lump sum, and a reward for their shares in the faculty's aggregate research output:

$$Y_i = a + bD_i + (B - aM - b\sum_{i'=1}^{M} D_{i'})\left[\frac{X_i}{\sum_{i'=1}^{M} X_{i'}}\right]. \tag{4}$$

III. Incorporating a Fix Inequality Aversion into the EIE Allocation Scheme

It is suggested that a fraction $0 < f < 1$ of the annual faculty budget for supporting academic staff members' research related activities will be allocated by equality and infancy criteria:

$$aM + b\sum_{i'=1}^{M} D_{i'} = fB. \tag{5}$$

The fraction f is predetermined and represents the degree of inequality aversion. For instance, indifference between equality and efficiency in fund allocation is displayed by $f = 0.5$.

Fixing the budget share allocated by non-efficiency considerations, the extra lump sum accruing to new starters can be expressed as:

$$b = \frac{fB - aM}{\sum_{i'=1}^{M} D_{i'}}. \tag{6}$$

The substitution of Eq. (6) into Eq. (4) renders the EIE research funding scheme as:

$$Y_i = a + \left[\frac{fB - aM}{\sum_{i'=1}^{M} D_{i'}}\right] D_i + (1-f)B\left[\frac{X_i}{\sum_{i'=1}^{M} X_{i'}}\right]. \tag{7}$$

IV. Individual Research Output Score's (X_i) Formula

The proposed research output score formula takes into account quality, quantity and contribution aspects by differentiating among 14 (or more) types of research output, assigning different values for different types or research output, deflating these values by the number of authors, adding a principal-author bonus and subtracting a minor-author levy. Research output is classified into:

4 different quality categories of Refereed Journal Articles (RJA1 - RJA4 in descending rank),
2 (or more) different quality categories of Authored Research Books (RB1, RB2 in descending rank),
2 (or more) different quality categories of Edited Research Books/Volumes (ERB1, ERB2 in descending rank),
2 (or more) different quality categories of Chapters in edited research books/volumes (C1, C2 in descending rank),
2 (or more) different quality categories of Proceedings (D1, D2 in descending rank),
Working Papers (W), and
Seminar Papers (S)

The values (points) assigned to these 14 research-output types are indicated by $p_1,\ldots,p_{14}$. They are deflated by the number of authors N, increased by a principal-author (F=1, zero otherwise) bonus of p percentage point, and reduced by a minor-author (L=1, zero otherwise) levy of d percentage point.

The proposed formula for computing faculty members publication score is:

$$X_i = \underbrace{p_1 \sum_{j_1=1}^{J_{1i}} \left(\frac{1}{N_{1ji}} + pF_{1ji} - dL_{1ji} \right) RJA1_{ji} + p_2 \sum_{j_2=1}^{J_{2i}} \left(\frac{1}{N_{2ji}} + pF_{2ji} - dL_{2ji} \right) RJA2_{ji}}_{First\&Second-Rank-\mathrm{Re}fereed-Journal-Articles}$$

$$\underbrace{+ p_3 \sum_{j_3=1}^{J_{3i}} \left(\frac{1}{N_{3ji}} + pF_{3ji} - dL_{3ji} \right) RJA3_{ji} + p_4 \sum_{j_4=1}^{J_{4i}} \left(\frac{1}{N_{4ji}} + pF_{4ji} - dL_{4ji} \right) RJA4_{ji}}_{Third\&Fourth-Rank-\mathrm{Re}fereed-Journal-Articles}$$

$$\underbrace{+ p_5 \sum_{b_1=1}^{B_{1i}} \left(\frac{1}{N_{b_1i}} + pF_{b_1i} - dL_{b_1i} \right) RB_{b_1i} + p_6 \sum_{b_2=1}^{B_{2i}} \left(\frac{1}{N_{b_2i}} + pF_{b_2i} - dL_{b_2i} \right) RB_{b_2i}}_{Authored-\mathrm{Re}search-Books}$$

$$\underbrace{+ p_7 \sum_{e_1=1}^{E_{1i}} \left(\frac{1}{N_{e_1i}} + pF_{e_1i} - dL_{e_1i} \right) ERB_{e_1i} + p_8 \sum_{e_2=1}^{E_{2i}} \left(\frac{1}{N_{e_2i}} + pF_{e_2i} - dL_{e_2i} \right) ERB_{e_2i}}_{Edited-\mathrm{Re}search-Books}$$

$$\underbrace{+ p_9 \sum_{d_1=1}^{D_{1i}} \left(\frac{1}{N_{d_1i}} + pF_{d_1i} - dL_{d_1i} \right) D_{d_1i} + p_{10} \sum_{d_2=1}^{D_{2i}} \left(\frac{1}{N_{d_2i}} + pF_{d2i} - dL_{d_2i} \right) D_{d_2i}}_{Conference-\mathrm{Pr}oceedings}$$

$$+\underbrace{p_{11}\sum_{c_1=1}^{C_{1i}}\left(\frac{1}{N_{c_1 i}}+pF_{c_1 i}-dL_{c_1 i}\right)C_{c_1 i}+p_{12}\sum_{c_2=1}^{C_{2i}}\left(\frac{1}{N_{c_2 i}}+pF_{c_2 i}-dL_{c2i}\right)C_{c_2 i}}_{Book-Chapters}\,.$$

$$+\underbrace{p_{13}\sum_{w_i=1}^{W_i}\left(\frac{1}{N_{wi}}+pF_{wi}-dL_{wi}\right)W_{wi}}_{Working-Papers}+\underbrace{p_{14}\sum_{s_i=1}^{S_i}\left(\frac{1}{N_{si}}+pF_{si}-dL_{si}\right)S_{si}}_{Se\min ar-Papers}\,. \quad (8)$$

V. Recommendations

1. As it is difficult to compare quality of journals and their rates of rejection as well as the importance of other research-output outlays across disciplines, it is recommended that the EIE research fund allocation scheme consisting of Eq. (7) and Eq. (8) will be applied in each discipline independently from the other disciplines.

2. Discipline Parity: The share of each discipline in the faculty budget will be equal to its academic staff share in the faculty.

3. Each discipline will decide on the ranking of the various types of research outputs and their values ($p_1,\ldots,p_{14}$).

4. Special high values will be attached to papers published in top and second rank refereed journal and to authored research books published by well-known publishing houses.

5. The principal-author bonus will be one tenth ($p = 0.1$) making the share of the first author 0.6 in the case of two authors, 0.433 in the case of 3 authors, 0.35 in the case of 4 authors, etc. Similarly, the minor-author levy will be one fifth ($d = 0.1$) making the share of the minor authors 0.3 in the case of two authors, 0.233 in the case of three authors, 0.150 in the case of four authors, 0.10 in the case of five authors, 0.066 in the case of six authors, and (set to be) zero in the case of seven or more authors.

6. The inequality-aversion degree f will be gradually reduced from the present level (e.g., $f = 1$ where equal allocation applies) to the level reflecting equal weights for both equality and efficiency considerations ($f = 0.5$) over a period of three years (e.g., $f_1 = 0.8333$, $f_2 = 0.6666$, $f_3 = 0.5$) so as to allow members to adjust to the new allocation scheme.

7. The individual's research output score (X_i) will be computed with data on the last five years. A shorter period, say three years, might be insufficient for members investing huge effort in producing high-quality output and exposed to a high degree of uncertainty

(rejection), and therefore might divert excessive effort to mass production of law-quality research.

8. Consistently with the previous recommendation, new starters will have five-year grace with supplementary lump sum (b).

9. Transparency: The allocation scheme, Eq. (7) and Eq. (8), will be disclosed and explained to faculty members.

10. Anonymity: Each member will receive a report containing his, or her, funding level and share and research-output score and share. This information will not be disclosed to other faculty members. The distribution of research scores and funds and the associated degrees of inequality will be displayed with Lorenz curves and Gini coefficients.

Reference

Levy, Amnon, 1993, "An Efficient Rule for Allocating Remunerations to Academic Staff", *Economic Papers* 12, 2, pp 42-47.