

Bidding for Research Funds. Inter-Fields Differences and Predictors of the Evaluation Scores: Insights from a Romanian National Competition for Postdoctoral Grants

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Abstract: This study sought to address an important gap in the existent knowledge about the development of the Romanian research system by looking at a very specific population of young scholars who participated in the national competition for postdoctoral grants (2016) which included over 900 participants. The paper is structured by two main research objectives. Firstly, the analysis is focused on differences between scientific fields by looking at research entities which host young scholars' grant proposals, gender balance, young scholars' academic performance measured through a standardized indicator (Google Scholar H index), share of people trained abroad, and information about the evaluation process. Secondly, a linear regression model is built for analysing the relationship between research proposal's evaluation score and a series of individuals' characteristics and structural factors associated to entities which host young scholars' research proposals. An original database derived from individuals' CVs allows us to test a series of hypothesis and to reveal significant predictors for grant application's evaluation score. For instance, individuals' evaluation score is positively influenced by scholars' higher Google Scholar H Index, short-term and long-term experiences of formal education or training abroad. At the same time, younger participants and women researchers have statistically significant higher scores for their proposals.

Key words: research grants, academic competition, scientific fields specificity, international migration, Google Scholar H Index.

Introduction

For the last 20 years, the Romanian academic and research system gradually joined a global narrative in which individuals, teams as well as public or private organizations are competing for financial resources and access to research infrastructures. At an institutional level, the successive reforms of the Romanian system of higher education and academic research aiming towards that narrative were, broadly speaking, inspired by the processes of setting up the European Higher Education Area and European Research Area. The rationale and isomorphic mechanisms conducing to that institutional setting are thoroughly described by Reisz (2018). At an individual level, the transfer of practices that came along with the international staff exchanges and involvements in international teams also contributed to that trend.

In this paper we analyse empirical evidences resulted from a postdoctoral national competition (2016) for research grants, financed by the Romanian Government. The call covered eleven (11) scientific domains (fields) and the allocated budget was of 9 157 939 EUR. Out of a total of 947 submitted applications, 166 were successful.

The main objectives of the paper are twofold. Firstly, we aim to emphasize inter-fields differences in respect to several features of the scientific domain (e.g., gender distribution, applications' host institutions, researchers' H Index on Google Scholar and the prevalence of short- or long-term training abroad). Secondly, we test a series of predictors for applications' evaluation score. The Romanian research system is built on several distinct pillars and each of them has a high degree of specificity in terms of funding, research activity and internal structures. These pillars are public universities, private universities, public research institutes, private research infrastructures and non-profit organizations. Though, in our analysis, we distinguish mainly between universities and research institutes (Romanian Academy and

National Institutes of Research and Development) due to the extremely low number of applications hosted by other entities. At a national level, academics/researchers belonging to these entities are the main competitors in attracting research funding.

Our paper is built on an original database resulted from a detailed analysis of over 900 public brief academic CVs of young researchers who submitted one application in the national competition for postdoctoral grants (2016). The organizer of the competition (The Executive Unit for Financing Higher Education, Research, Development and Innovation - UEFISCDI) provided on its website a series of data about all participants including two downloadable files referring to individuals' academic CV and their self-assessed outstanding scientific results. In order to build a database, we combined the information provided by researchers in these publicly available files with other public information available on the internet (e.g., Google Scholar).

This paper offers detailed methodological information in the next section and provides the relevant analysis and results in the third section. The final part of the article points out a series of conclusions.

Methodology

All the information used in this paper is open data. A part of it was provided on the UEFISCDI website¹ and another part were available on Google Scholar. For each application UEFISCDI provided the CV of the principal investigator (maximum two pages) and their (self-assessed) outstanding scientific results (maximum three pages). A systematic analysis of these sections of each application allowed us to build a series of indicators and to conduct statistical analyses in order to understand the inter-fields differences and to estimate the applications' final scores. We provide below a description of each variable used in the section of analyses and results.

¹<https://uefiscdi.ro/proiecte-de-cercetare-postdoctorala>

Table 1. Description of the variables

Variables	Description
Scientific field	The call for application and the evaluation process was organized by UEFISCDI in 11 different broad scientific panels (see Table 2 for details).
Application's evaluation score	The final evaluation score is provided by the organizer of the competition on its website. The theoretical values range from 0 to 100 points. Each application was independently evaluated by three anonymous reviewers and the application's final evaluation score was a result of that process. The applicants' CV and their previous scientific outputs counted for 50% of the final score. The other half of the final score was linked to their mentor's CV – 10% and a research proposal – 40%.
Research entities	We distinguish between two main categories of research entities: applications hosted by universities and applications hosted by other research entities (mainly, application hosted by the Romanian Academy and National Institutes of Research and Development). In the analysis, the distinction is employed by using a dichotomic variable: coded 1 for universities and 0 for all the other research entities.
Universitaria Consortium	For those applicants who were affiliated to universities we built a dichotomic variable for differentiating between researchers from five universities gathered in the Universitaria Consortium: Babeş-Bolyai University, University of Bucharest, Alexandru Ioan Cuza University of Iaşi, Bucharest University of Economic Studies, West University of Timișoara (Universitaria Consortium = 1) and all other universities (= 0).
H Index	Individuals' H Index values were collected in the first three months after the applications' evaluation for avoiding any effects related to projects' implementation (projects selected for funding started in May 2018 and the H index values were collected in June - July 2018). The information was gathered using two complementary tools: firstly, all the public available profiles on Google Scholar were identified and H index was noted for 58% of the sample; secondly, a significant part of the missing information was computed using Harzing's Publish or Perish (Google Scholar as data source). The cumulative percent of valid information about Project directors' H index was 96% (904 cases). For standardization, each individual's H index value was reported to the average value within each field.

Experience of training abroad	<p>This variable was built on information from the individuals' academic CVs. For those researchers who mentioned experiences of studying abroad we created two dichotomic variables as follows: Long term abroad and Short term abroad.</p> <p>We labelled as long-time experience of training abroad all the cases when the applicants declared a degree (bachelor, master or doctoral) gained from an institution outside Romania. (YES = 1 and NO = 0).</p> <p>Short term training abroad includes non-degree international mobilities for training reasons (Erasmus stages, visiting scholar stages, summer schools, internships in academic institutions outside Romania, etc.) (YES = 1 and NO = 0).</p>
Doctoral diploma	<p>The number of years since the researcher obtained the doctoral diploma. This is the result of the year of competition (2016) minus the year of obtaining the doctoral diploma (information from their CVs). It varies from value 0 to value 4 according to the competition rule who allowed application for researchers who obtained the doctoral diploma maximum four years before 2016.</p>

We are fully aware how challenging it is to combine in the same data set research trajectories for scholars from various scientific fields. However, in our opinion this is a unique opportunity to analyse multiple inter-fields differences among young scholars and to reveal important predictors for their results within a national competition.

Along with the descriptive analysis of the specificity of each scientific field, we tested a series of hypotheses about the main predictors of the final evaluation scores. These are presented below.

Firstly, we expected to find a positive relationship between previous academic accomplishments and the evaluation score of the application due to a self-reinforcement dynamic of the academic success (Bol, de Vaan, and van de Rijt 2018). H Index on Google Scholar is used as a numeric measurement for individuals' academic performance and our first hypothesis (H1) is that people who have a higher H Index are expected to register higher evaluation scores, even if the H Index was not used as an official criterion in the evaluation process. One of the limits of this predictor is linked to the early phase of our individuals'

career and the low values registered for H Index for numerous researchers included in the study. However, having in mind the high level of inter-fields variation we calculated the distance to the average value of the field for each individual (the average values were calculated using all the valid information for the applicants from the same scientific field).

H1. The evaluation score is higher for those researchers who have a higher H index.

Secondly, Romania is one of the main origin countries for intra-European temporary migrants (Recchi et al. 2019). Even if the country's flows of emigration are mainly driven by the search of better employment opportunities abroad (economic migrants), there is an important share of young population which emigrate for studying abroad and some of them return to their country of origin when they complete their education (Ferro 2004; Sandu, Toth, and Tudor 2018). We expect young scholars who declared in their CVs these types of training experiences abroad to obtain higher score than those who stated that their educational trajectories developed only in Romania (H2a and H2b). There are multiple reasons beyond this hypothesis: firstly, they were exposed to different educational systems and this has the potential to improve their stock of knowledge and their abilities (Klagge and Klein-Hitpaß 2010; Williams 2007); secondly, having experience of studying abroad is positively evaluated within the Romanian society (for example, in the most recent national elections, a main party included in its electoral message the total number of years studied abroad by candidates affiliated to it); thirdly, the applications were written in English and we can expect that people who had experiences of studying abroad to have better proficiency in foreign languages (Ammon 2001).

H2a. The evaluation score is higher for those researchers who declared in their academic CVs long experiences of studying abroad (a diploma obtained abroad).

H2b. The evaluation score is higher for those researchers who declared in their academic CVs periods of short-term mobility abroad.

Thirdly, those individuals who split their working time between research and teaching activities are expected to be less successful within a competition in which the evaluation is exclusively based on prior research outcomes. We assume that an application submitted by a young scholar affiliated to a university would register a lower evaluation score compared to an application submitted by a young researcher affiliated solely to a research entity/institute.

H3. The evaluation score for the applications submitted by young scholars affiliated to universities will be lower compared to the score of the applications submitted on behalf of research institutes.

Our database is not representative for the entire population of Romanian young researchers, but it includes the whole population of young researchers participating in the national competition for post-doctoral grants in 2016. This sample is self-selected based on the individual's desire to obtain funding for postdoctoral research as well as selected by the UEFISCDI on some formal criteria. Firstly, the applicants had to get institutional support of a host institution for implementing the project, they had to be less than 41 years old at the moment of the application and the number of years since they have obtained their doctoral degree had to be less than or equal to 4 (four). At the same time, the organizer of the competition promoted quality criteria for applicants and one of the conditions for having chances to be financed was that the applicant had to prove a scientific visibility above the average².

²The scientific visibility above the average was linked to the quality of applicants' publication portfolio. Each scholar had to fill in a list with their main five publications and the call stated evaluation standards linked to the impact factor of the journals where the articles were published.

Analysis and Results

In the first part of this section, we provide an overview on some of the main differences resulted from the inter-fields comparisons. In the second part, a linear regression model is developed to test the hypothesis formulated above and to contribute to a better understanding of the evaluation process.

In analysing the inter-fields differences, we pay attention to a series of individual and institutional factors. The descriptive analyses presented in *Table 2* provide relevant information about several differences between scientific fields in terms of: the research infrastructure hosting young scholars' applications, gender distribution, academic performance, share of people trained abroad, and information about the evaluation process.

Firstly, the number of applications submitted in each field varied from 34 in Chemistry to 149 in Health suggesting a different level of competition in each scientific field. However, the call for applications stated a similar rate of success in each scientific field (about 15%).

The data show that universities are the main host institutions for young researchers competing in the national post-doctoral competition (75%). However, the differences are highly dependent on the scientific field. While in some fields the competition is almost entirely dominated by researchers affiliated to universities (for example, in Social Sciences and Humanities 92% of the applicants are affiliated to universities), in others (like Physics) we can observe a majority of young researchers affiliated to other categories of research entities. A rather balanced distribution can be noticed only in Materials Science and Chemistry. Multiple explanatory factors concur for this state. One of the main reasons is probably linked to the fact that the doctoral schools in Romania are mostly linked to universities. That creates useful social networks and institutional attachments for those interested in continuing as researchers after finalizing the doctoral programme.

The gender distribution is the result of multiple effects including self-selectedness at various stages of the educational trajectories (e.g. high-school, bachelor, master, doctoral). Within the competition, male researchers are more often candidates in Mathematics and Computer Sciences, Earth Sciences, and Engineering, while female researchers are prevalent in Applied Life Sciences and Biotechnologies, Biology and Ecology, Health, Social Sciences and Economics. Among young scholars interested in pursuing research careers, a more balanced gender distribution is in Humanities, Chemistry and Physics.

Scientific field of the application	Number of applications	Gender distribution (share of women)	Share of universities as host institutions	H-index values			Training Abroad		Applications' evaluation score		
				Maximum value	Average of the field	H Index ≤ 3 (share)	Long term stay abroad	Short term stay abroad	Minimum score	Maximum score	Average of the field
1. Chemistry	34	56%	56%	16	5,21	36%	18%	59%	56	98	86
2. Physics	43	46%	35%	14	5,54	27%	21%	69%	46	98	83
3. Materials Science	71	61%	47%	21	5,47	29%	11%	50%	54	96	83
4. Earth Sciences	53	38%	75%	20	4,78	37%	9%	57%	53	98	82
5. Mathematics and Computer Science	49	31%	75%	16	5,54	25%	22%	41%	58	98	82
6. Humanities	122	48%	83%	10	1,27	93%	24%	57%	58	98	80
7. Health	149	67%	85%	20	5,31	37%	7%	64%	43	96	79
8. Biology and Ecology	61	69%	66%	14	4,69	39%	8%	57%	42	96	79
9. Applied Life Sciences and Biotechnologies	106	74%	80%	17	4,08	48%	10%	49%	36	96	78
10. Engineering Sciences	126	41%	75%	15	4,39	44%	10%	44%	42	98	75
11. Social Sciences and Economics	122	62%	92%	11	3,54	59%	18%	61%	45	98	74

Table 2. Overview on the post-doctoral competition. Sources: UEFISCDI's website (including individuals' CVs listed on the website) and Google Scholar

Several interesting insights can be derived from the H Index inter-fields variation (Table 2). There is a high specificity in Humanities with the lowest average value (1,27) and about 93% of young scholars with values less than or equal to a H Index of 3. Social Sciences and Economics are also on average bellow all the other fields (3,54), but much closer than Humanities to the other fields. As a general observation we can see that about half of the entire population has a H Index equal or below a value of 3 (48%), but the variation is from 25% in Mathematics & Computer Science to 93% in Humanities. These important differences can be caused by several factors. Individual researchers and institutional entities entered differently in the new logic of the 'ranking regimes' (Gonzales and Nunez, 2014). The high specificity of the practices from each scientific field frames the individual's academic performance measured employing standardized tools such as H Index on Google Scholar (Radicchi, Fortunato, and Castellano, 2008). In some fields the usual practice is to publish team papers while in others the typical publications are signed individually and that impacts the total number of citations as well as the researcher's H Index (Bornmann and Daniel, 2008). In spite of its numerous limits, we think that one can find useful information about inter-fields variation of the H Index of the young researchers who submitted applications for the national post-doctoral competition. Further in the paper, the regression models will use a standardized measurement based on individual's H index difference reported to the average value of the field.

In Romania, the scientific fields had different historical evolutions during the communist and post-communist period. Having a similar approach during the communist period in the Romanian universities and research institutes some scientific disciplines were suppressed while others benefited from the state's support (see for example the case of suppression of Sociology detailed by Bosomitu, 2017). It is beyond the aim of our study to enter into this historical evolution of

scientific fields, but these can constitute premises for the significant differences between fields when we speak about academic performance, internationalization and the scholars' international mobility. *Table 2* also presents the main descriptive statistics for both, long-term and short-term training experiences abroad. On the one hand, we can see a group of scientific fields in which around 20% of young scholars had long experiences of training abroad and these are certified by a diploma. In all the other scientific fields the percentages are grouped around the value of 10%. On the other hand, we can see that in some scientific fields the main pattern of mobility is expressed by short periods of training abroad (e.g. Health), while in Mathematics and Engineering Sciences are registered the lowest levels of participation in short-term trainings abroad.

The last columns of the *Table 2* reveal a series of differences regarding the evaluation process. The minimum score and the average vary from one field to another and this will constitute a solid reason for using a standardized measure further in the linear regression model. One can speculate that the level of expertise is higher in some fields and that generate higher average scores or perhaps the reviewers from some fields have higher standards in evaluation and that generated lower scores. Unfortunately, the data set does not allow us to see why the average score is 80 in Humanities and 74 in Social Sciences & Economics even if the number of applications is similar.

The last part of this section is focused on testing each of the hypotheses stated in the methodology section. A linear regression model is built on the variables presented in *Table 1* (please see the methodology section). The dependent variable (DV) is the *application's evaluation score* and we use a set of predictors measured at individual level (age, gender, experience of training abroad, years since doctoral degree) as well as some indicators relevant for the host institution of the application (Universities versus other Research Entities, *Universitaria* Consortium versus other Universities). The application's scores are mean centred in respect with each field of study. That is each

individual score included in the analysis is calculated by subtracting the mean value within each scientific field from the final score of each application from. For example, the average score in Social Sciences and Economics is 74 and an application evaluated with 80 points will have the value +6. In Health the mean value is 79, and an application with 80 points will receive the value +1.

The linear regression model is built on 866 valid cases and has the *Adjusted R Square 0,264*.

The analysis shows that one of the independent variables has no significant impact on the evaluation score: *number of years since doctoral degree* was obtained by the researcher. All the other independent variables have significant relationships with the DV.

The individual's H Index is the main predictor and has a positive influence on the application's evaluation score. Two intriguing results are related to candidate's host institution. Firstly, affiliation to a research institute compared to a university significantly increases the evaluation score. Secondly, those applicants who were affiliated to one of the five universities from the *Universitaria Consortium* have higher evaluation scores compared to candidates from other universities. As we anticipated, both diploma from abroad and short-term training experiences abroad increase the individuals' evaluation scores. Within this competition, female researchers have significantly higher evaluation scores. Lastly, the regression model reveals that applicant's age is in a negative relationship with the evaluation score and younger applicants had higher evaluation score.

Table 3. The linear regression model for predicting the application's evaluation score

Model & Coefficients:	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	11,477	3,366		3,409	,001
H Index	1,605	,114	,428	14,129	,000
Diploma from Abroad	2,183	,928	,069	2,352	,019
Short Term Abroad	1,729	,642	,079	2,691	,007
No. of years since doctoral degree	,020	,267	,002	,075	,941
University as Host Institution (UNIVERSITY = 1)	-5,620	,788	-,222	-7,132	,000
UNIVERSITARIA CONSORTIUM	4,000	,760	,168	5,266	,000
Gender (Female = 1)	1,102	,638	,051	1,729	,084
AGE	-,322	,103	-,096	-3,122	,002
Dependent Variable: EVALUATION SCORE (computed as difference to the mean of the field)					

Conclusions

The comparative research design allowed us to emphasize a series of inter-fields variations in the case of the Romanian national competition for post-doctoral grants (2016). The organizers' decision to structure the evaluation process in 11 different panels allowed us to explore the heterogeneity in evaluation and to draw specific profiles for each scientific field. The analyses pointed out that universities are more frequently used as host institutions by young scholars interested in developing careers in research, but other research entities offer more fertile ground for writing applications with higher evaluation scores. Further research should explain if this result is caused by know-how transfers within institutional networks or by the fact that numerous

applicants from universities divide their work between teaching and research activities.

The competition succeeded to attract men and women candidates as well, and women submitted 56% out of the total applications. The analyses illustrated important differences from one field to another and 6 domains out of 11 registered over 50% of applications submitted by women. In this explanatory model, female young scholars have significantly higher evaluation scores and better chances to obtain research funds.

The H index varies from a scientific field to another and this is in line with findings of larger international research studies. The analysis shows a high gap between Humanities and all the other scientific fields. Social Sciences and Economics are closer to the average value, but still lower between the average mean value for the entire competition. The individual's H index was the most important predictor of the application's score and young researchers with high H Index values had better chances to obtain higher scores and to implement projects funded within this post-doctoral competition. This demonstrates that such competitions are also effective reinforcing mechanisms for academic performance.

Our research also contributes to a better understanding of the importance of a young individual's training experiences abroad. Analysing the academic CVs of the candidates we can point out that the percentage of young researchers who entered into long-term or short-term migratory pathways for training varies from one field to another (only in three scientific fields the total percentage of young scholars who did not indicate any training abroad is over 50%, while in the other eight scientific fields the majority noted at least short-term trainings abroad). Training abroad proved to be a significantly statistic predictor for the evaluation score. Even if this is not unexpected, our analyses reveal that migration for study reasons can provide important competitive advantages in building an academic career as a young researcher. It goes beyond the usual approach which argues for the

migration utility on evidences derived from migrants' subjective evaluations of the migratory experience and provide an objective measurement of these outcomes.

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