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The model of maximum productivity for research universities SciVal author ranks, productivity, university rankings, and their implications

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Abstract

Aware of the growing importance of global rankings, universities aim to enhance their positions. However, the exact relation between research productivity and ranking positions is not fully understood in recruitment processes. Taking the field of communication as a case study, this paper analyzes the scholarly performances of 6291 faculty members from 172 QS top-ranked communication departments, and it also offers an experiment in which we tested top departments' interest in recruiting a highly productive communication scholar. We found that while both departments and scholars are aware of the connection between productivity and excellence, there is still room for improvement. Even in the top ranked communication departments, there is a significant scarcity of best-performing scholars, but it is hard to employ a top scholar beyond the usual job posting methods. Contrary to the Standard Model of Productivity, whereby recruitment is based on assumptions and potential, we offer our Model of Maximum Productivity where both recruitment and assessments are based on scientometrics, productivity and evidence alone.

Keywords Research production · Research assessment · University rankings · SciVal

Introduction

In countries with so-called developed economies, we live in a knowledge society and knowledge economy (Castelfranchi, 2007; Cummings et al., 2018; Vallima & Hoffman, 2008), in which human capital is the primary engine of development and growth (Cummings et al., 2003; van Weert, 2006). Universities play a crucial role in these societies

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because they produce, transmit, disseminate, and communicate knowledge and are thus the most important sources for developing human capital (Becker, 1962; Rindermann, 2008). In this situation, agile students, prospective scholars, selection committees and recruiting bodies put more and more emphasis on the associated values and prestige of universities that are, at least partially, assessed by various university rankings (Schmitt, 2012; Tomlinson & Freeman, 2018). While its impact varies between different international rankings, the most important criteria for university evaluation is research excellence, usually measured in the publication output of faculty members in internationally recognized academic journals (Demeter, 2020). This factor affects ratings far more than teaching excellence; thus, it is in the primary interest of departments to employ the most productive researchers available (Burris, 2004; Pietrucha, 2018). Since having a good position on these rankings has a significant impact on the interests of international students (Herschberg et al., 2018), and since the number of international students is also an important factor in university rankings (Ennew & Greenaway, 2012), publication excellence boosts the position of departments.

In line with the recognition of the importance of university rankings, there is a wide-ranging debate amongst professionals, policymakers and academic quality management on how to improve university performance on these rankings (McCormack et al., 2014). However, while there is extensive literature on recruitment processes and university performance on global rankings (Kaiser & Pratt, 2016; Williamson & Cable, 2003), we have limited knowledge on how these two dimensions relate to each other. Specifically, we lack empirical studies that directly focus on the association between faculty members' productivity and the prestige of their departments, measured by their positions on university rankings. Taking communication and media studies as an example, this current study contributes to the discussion on how academic rankings correlate with research excellence and recruitment. Based on the literature review, we constructed a Standard Model of Productivity (SMP) that describes how researchers in the field understand the relations between recruitment, working environment, productivity and ranking positions, and we test if the assumptions of the SMP can be corroborated by empirical evidence.

Our results show that the SMP should be modified to better explain how productivity can be enhanced, and we found that research excellence could be further increased if departments put more emphasis on productivity in the recruitment process. Based on our synthetic insights, we offer an alternative model entitled the Model of Maximum Productivity (MMP) and also formulate policy conclusions.

Productivity, recruitment and academic positions

Due to the growing interest of universities in improving their international rankings (Herschnerg et al., 2018; Pietrucha, 2018), research productivity, as measured by the number of publications in indexed journals, has become one of the most important factors in research assessment (Ennew & Greenaway, 2012). With the prevalence of international assessments and the growing importance of university rankings, the infamous "publish or perish" paradigm has been restricted to publishing in internationally recognized journals (Erren et al., 2016; Hamann, 2016; Kurambayev & Freedman, 2020; Oancea, 2019). As Astaneh and Masoumi (2018) suggests, being published in indexed journals has become the gold standard within international academia in terms of both research assessment and internationalization policies. Besides university rankings that make their assessments on

the basis of publication records (Pietrucha, 2018; Sasvári & Urbanovics, 2019), several research assessment systems and policies such as the British Research Excellence Framework (REF), the Spanish Agencia Nacional de Evaluación de la Calidad y Acreditación (ANECA), AERES in France, or the European Technology Options Assessment (STOA) also recommend working with data on publication records in Scopus or Web of Science indexed international journals (Mahieu et al., 2014). The rationale behind this exclusivist selectivity is that most research institutions, international rankings, funding agencies, and even policymakers assume that publishing in leading journals is a sign of quality research and a reliable predictor of future impact (Győrffy et al., 2020; Larivière & Costas, 2016). As Civera et al. suggests (2020), if increasing ranking positions is a strategic goal, then university policies should incentivize the maximalization of publication output.

Empirical research shows that the best predictor of future productivity is past productivity (Győrffy et al., 2020; Kaiser & Pratt, 2016) and papers published in indexed journals are widely considered as the "currency of science" (Génova et al., 2016; Kekale, 2018) or the "currency of academic business" (Kaiser & Pratt, 2016). Since hiring new faculty members is a considerable investment, it is not surprising that the topic of employee recruitment has attracted considerable attention. In fact, as employers are becoming more strategic with regard to talent management, the importance attached to recruitment has increased (Schmitt, 2012, p. 68).

Strategically, research excellence and productivity should be the main criteria in faculty member selection decisions, and the significance of other factors like the place of education, the role of supervisors, mobility or academic inbreeding should have less importance in recruitment decisions (Altbach, 2004; Demeter, 2019; Herschberg et al., 2018; Verginer & Riccaboni, 2021). Thus, given the direct connections between productivity, research excellence and consequently high ranking positions, we would assume that university managements and department chairs would place considerable emphasis on productivity in the recruitment process, and would try to hire the most productive scholars in a given field so as to boost their research output, as this is an element measured by most university rankings (Burris, 2004; Pietrucha, 2018; Tomlinson & Freeman, 2018). However, extensive literature shows that, despite it being the most important predictor of future excellence, productivity is not the most important factor in the recruitment process as it entails many nonmeritocratic factors (Clauset et al., 2015). There is a plethora of empirical evidence showing that prestige factors, typically the place of candidates' PhD, have a much greater impact in determining their chances in recruitment processes than their measurable productivity (Baldi, 1994; Cret & Musselin, 2010; Enders, 2001; Long et al., 1979; Smith et al., 2004; Tomlinson & Freeman, 2018; Williamson & Cable, 2003). According to Burris (2004), the prestige of the PhD school of candidates is the most important factor in recruitment. This tendency helps to develop an exclusive network of faculty members that have their PhDs from elite universities (Clauset et al., 2015; Cowan & Rossello, 2018; Maliniak et al. 2018), but its efficiency in improving research excellence and ranking positions is questionable. Williamson and Cable (2003) systematically analyzed possible correlations between productivity and prestige factors, and found that neither the supervisor, nor the place of doctoral school play a significant role in future productivity. In consonance with other studies (Baldi, 1994; Fumasoli et al., 2015; Győrffy et al., 2020; Long et al., 1979; Musselin, 2004), they found that the only predictive factor of future productivity is past productivity.

Besides past productivity, another factor considered to be predictive for future productivity is the prestige of the institution where scholars work. Based on a comprehensive

literature review, Cruz-Castro and Sanz-Menéndez (2010) report that the prestige of a given institution correlates with productivity, but the direction of causality is unclear. It is either that the working conditions and the institutional culture make employees conform to the publication requirements of the department; or that departments become distinguished as a result of them hiring the most productive scholars. In accordance with our normative expectations, both Crane (1965) and Hargens and Hagstrom (1967) found a moderate positive correlation between productivity and the prestige of the hiring department, and they interpreted the findings as indicating that the top departments hire the most productive scholars. However, other studies found that the effect of productivity on recruitment is very weak: Long et al. (1979) reported that scientific production is significantly less important in the recruitment process than the location of the candidates' PhD. Crane (1965) cites a vast amount of literature to the effect that it is the environment of the best universities that makes their employees perform better, and thus there is a direct one-directional connection between university prestige and productivity.

Among many possible explanations (Demeter & Tóth, 2020), there are two specific motivations behind favoritism towards candidates with elite degrees. According to the stratification hypothesis, hiring patterns follow a hierarchy to establish a rank-based network of recruitment between elite higher education institutions. Through this hierarchy, top universities participate in a win–win game in which the source university (the one from which applicants earned their Ph.D.) will be highly assessed given the fact that another top university is willing to hire its Ph.D. graduates. In return, the source institution also highly rates the host institution (the university where its Ph.D. graduate applies for a position), because it considers this institution to be appropriate (Clauset et al., 2015; Cowan & Rossello, 2018; Maliniak et al., 2018). Besides the explanation that co-hiring each other's former students helps to develop and maintain an "elite club", there is a more practical explanation that emphasizes the importance of social networking, academic culture and the quality of education. According to this explanation, former students of elite institutions have a great potential for academic development as they most likely have better education, are more adapted to the international academic culture, and, through the network of their supervisors, they have better connections with established scholars that can enhance future international collaboration (Cret & Musselin, 2010). Notwithstanding, empirical evidence does not always support this assumption (Mussellin, 2004; Williamson & Cable, 2003), and thus scholars question if education history should be a decisive factor in recruitment (Demeter, 2019).

The standard model of productivity

Based on the literature, we can construct the Standard Model of Productivity that makes it possible to describe and explain the alleged correlations between university prestige, productivity, and recruitment strategies. According to this model, while productivity is not the main factor in the recruitment process (Burris, 2004), the environment of leading departments boosts the publication record of newly appointed scholars (Long et al., 1979), thus, in a few years, the new employee's productivity will be similar to those of the other faculty members (Canagarajah, 2002). As a consequence, the productivity of affiliated scholars will be balanced, which helps to maintain or even improve the department's position on university rankings. In this model, the input is the prestige of the doctoral school and the assumed potential (knowledge, diligence, talent) of the candidate. According to the

standard model, the potential of candidates is inferred from the prestige of their doctoral schools, not from their productivity. Later, as a result of the outstanding working conditions (environment, infrastructure, research funds) provided by elite departments, research productivity improves over time, leading to better ranking positions. From the perspective of global rankings, departments are assessed by their productivity in an evidence-based manner, while departments recruit their employees based on their assumed potential.

Hypotheses and research question

To test the standard model, we constructed four hypotheses that relate to the correlation of different scientometric parameters and university rankings, while our research question relates to the willingness of leading departments to cooperate with an extremely productive scholar.

Rationale

The direct association between the number of published papers and university ranking positions are straightforward: to a certain extent, all the most popular rankings operate with scholarly output. Thus, we did not intend to analyze the direct association between publication output and ranking position. Instead, we asked if departments recruit the most productive scholars. As contrasted with the aforementioned association, this question is far from being self-evident as we measured the share of the most productive scholars across departments, and not the individual or the average publication record of faculty members. With this, we intended to acquire a picture of the association between productivity and the likelihood of being recruited at top departments. Our hypotheses quantitatively tested this association on different levels, while the research question calls for a more qualitative approach.

The rationale of the analysis is based on the concept of competition between world-class universities and departments. As, on the basis of university rankings' methodologies, there is a positive association between the number of published papers and ranking position, departments are interested in recruiting extremely productive scholars. However, the pool of the most productive researchers is limited, and thus we might assume the existence of a competition between departments in recruiting from the pool of scholars that publish the most. If this is the case, we can suggest that being listed as one of the most productive scholars worldwide is an important factor in recruitment, and departments with many scholars from this pool have higher positions on university lists.

Hypotheses In line with the corresponding literature, we assumed a growing importance of productivity over time (Erren et al., 2016; Hamann, 2016; Kurambayev & Freedman, 2020; Oancea, 2019). Thus, we developed two pools of scholars to test our hypothesis. The first group consisted of established scholars (ES) with an excellent publication record over the last 10 years. The second group was made up of emergent scholars (EM) having shown an excellent level productivity over the last 4 years. Accordingly, we were able to compare the ES and EM groups in terms of both productivity and recruitment.

Based on the specific calculations of university rankings in general (Pietrucha, 2018), and of QS ranking in particular (Sasvári & Urbanovics, 2019), the model suggests that the

number of papers published in Scopus is very important when it comes to rankings. Our hypothesis tests this association on different levels. Since SciVal ranks authors by the number of their Scopus-indexed papers, we hypothesize that.

H1 The number of the most productive faculty members is positively associated with the department position on the QS rankings

We tested our hypothesis (a) in the group of the established scholars (ES) and (b) in the group of the emerging scholars (EB). Also, we tested the association in three different levels (1) amongst the top 500 scholars; (2) amongst the top 100 scholars; and (3) amongst the top 30 scholars. Table 1 summarizes the levels in which we tested H1.

Without reference to the faculty members' SciVal position, we also presumed that most scholars are productive enough to improve the ranking position of their departments, even if they are not listed amongst the top 500 most productive scholars. If this is the case, then the bigger a department is, the most likely it has good ranking position (Golden & Carstensen, 1992). Thus, we hypothesized that the number of department members is also predictive of ranking positions:

H2 The number of department members is positively associated with the department's position on the QS ranking.

As we have seen in the literature (Demeter, 2019; Győrffy et al., 2020), future excellence can—mostly—be predicted by past excellence. Thus, we suggest that universities should first hire the most productive scholars from both the categories of established and emerging scholars. Second, as research productivity might be continuous over time (Larivière & Costas, 2016), we assume that those who were productive over the last 10 years (ES group) were also productive in the last 4 years (EM group). Thus, we hypothesize that.

H3 The number of the most productive scholars in the ES group is positively associated with the number of the most productive scholars in the EM group.

We followed the method for H1, thus we tested the association between ES and EM on three levels: (a) among the top-500; (b) among the top-100; and (c) among the top-30 scholars.

Besides the aforementioned factors (past productivity and education), another factor is assumed to influence productivity: the gender of scholars. Following Rossiter's (1993) work that introduced the concept of the Matilda effect (the under-representation of female scholars in the academia), a legion of analyses was conducted in different fields, but the results are contradictory. Some scholars found evidence for the Matilda effect (Baldi, 1998; Hakanson, 2005), while other researchers did not (Haslam et al., 2008; Over, 1990). The

Table 1 Testing groups for the first hypothesis H1

Levels	Groups	
Top 500 scholars	Established scholars	Emerging scholars
Top 100 scholars	Established scholars	Emerging scholars
Top 30 scholars	Established scholars	Emerging scholars

findings vary across the analyzed periods, disciplines, and the applied methodologies should also have an influence on the findings regarding female under-representation, especially in the case of the most productive scholars (Zhang et al., 2021). Based on this line of research, our last hypothesis assumes that the proportion of male scholars among the most productive scholars will be higher that their female peers.

H4 The share of males is higher than the share of females among the most productive scholars in the pool of the faculty members of the top 200 communication departments,

We tested this association on three levels: (a) among the top-500; (b) among the top-100; and (c) among the top-30 scholars.

Research question

In contrast with earlier qualitative studies (Fumasoli et al., 2015; Herschberg et al., 2018), we developed a genuine experimental situation, in which an extremely productive researcher wrote to various department chairs, offering to collaborate with them. The answers were then compiled and subjected to a content analysis.

We assumed that, as departments are aware of the correlation between productivity and ranking positions (Hamann, 2016), productivity might emerge as an important factor in hiring decisions (Fumasoli et al., 2015). Thus, we hypothesized that since departments are interested in raising the number of the most productive scholars, they will positively respond to an inquiry by an extremely productive scholar offering to collaborate with them. Thus, we formulated a research question to analyze.

RQ1 how departments respond to a collaboration inquiry from a top performing scholar?

Methods

Quantitative scientometric protocol

In this study, we aimed to analyze the productivity of the faculty members of all the QS-ranked communication departments as they were represented on the 2020 QS World Communication ranking ($n = 200$). We used Scopus data for the analysis, because three of the most recognized international university rankings (except for the Academic Ranking of World Universities (ARWU), which uses the Web of Science database (Liu & Cheng, 2005)), use Elsevier's Scopus when assessing the publication output of universities and departments (Pietrucha, 2018; Sasvári & Urbanovics, 2019). The Times Higher Education (THE) ranking uses both the Web of Science and Scopus when calculating the productivity and impact of researchers affiliated with a given department, while the QS World University Ranking works exclusively with Scopus. For the selection of the most productive scholars in the field, we used SciVal, which is based on Scopus data. Rankings are constructed on the basis of the number of authors' publications in Scopus-indexed journals in a given time period. With this methodology, the assessment protocol of QS, the ranking protocol of SciVal and the publication pool of Scopus can be totally synchronized.

In 28 instances, we failed to obtain a full list of faculty members, thus we included 172 communication departments for further analysis. We collected the names of all academic

faculty members ($n = 6291$) and checked their positions on two different SciVal lists. The Established Scholars (ES) list was produced by the SciVal worldwide ranking, taking the 2010_2019 period. This list ranks the top 500 scholars amongst those who published the most Scopus-indexed papers between 2010 and 2019. The Emerging Scholars (EM) list was produced by the SciVal worldwide ranking, taking the 2017_2020 period. This list ranks the top 500 scholars amongst those who published the most Scopus-indexed papers between 2017 and 2020. We used these two groups of researchers to compare the productivity of scholars having an excellent publication record over the last decade (the group of established scholars) with the group of emergent scholars who had published the most over the last 4 years.

We recorded the ES and EB positions of each scholar from the selected departments, and, based on the data obtained, we developed several variables as follows.

Variables (codebook)

Ranking position This variable indicates the position of the department on the 2020 QS Communication Ranking ($M = 86.5$; SD $= 49.79$; max. $= 172$; min. $= 0$). We used a reciprocal coding for statistical analysis; thus the first position has the value 172, the second the value 171, and the last department (actually, the 172nd in the ranking) has the value 1. When we interpret the results, higher values of this variable refer to better positions.

Gender we used binary variable for coding gender (1 = male, 2 = female).

Number of faculty members This variable indicates the number of full staff members in the department. ($M = 36.53$; SD $= 32.82$; max. $= 211$; min. $= 6$).

Number of TOP500 EM This variable indicates the number of top 500 ranked faculty members in each department on the SciVal EM list. ($M = 1.15$; SD $= 2.20$; max. $= 18$; min. $= 0$).

Number of TOP500 ES This variable indicates the number of top 500 ranked faculty members in each department on the SciVal EM list. ($M = 1.05$; SD $= 1.79$; max. $= 12$; min. $= 0$).

Number of TOP100 EM This variable indicates the number of top 100 ranked faculty members in each department on the SciVal EM list. ($M = 0.25$; SD $= 0.75$; max. $= 6$; min. $= 0$).

Number of TOP100 ES This variable indicates the number of top 100 ranked faculty members in each department on the SciVal EM list. ($M = 0.18$; SD $= 0.55$; max. $= 4$; min. $= 0$).

Number of TOP30 EM This variable indicates the number of top 30 ranked faculty members in each department on the SciVal EM list. ($M = 0.08$; SD $= 0.37$; max. $= 3$; min. $= 0$).

Number of TOP30 ES This variable indicates the number of top 30 ranked faculty members in each department on the SciVal EM list. ($M = 0.04$; SD $= 0.22$; max. $= 2$; min. $= 0$).

Hypothesis tests were conducted for hypotheses 1 to 3 by linear regression, as reported under the Results section.

Qualitative experimental procedure

Our research question (Q1) was tested by a qualitative experiment. We took the SciVal profile of an extremely productive researcher from the set of the TOP30 researchers in communication in the EM group. With the written and informed consent of the researcher,

we wrote a letter to the chairs of the analyzed communication departments in which the researcher offered their professional collaboration.

> I am currently seeking a research position (ideally, working as half-time non-residential researcher, though I am open to other opportunities as well) at a leading institution of my field that will support my work both with funding and with interactions with faculty having common research interests. I can contribute to the advancement of the institution through the publication of my papers, and by joining existing research teams on topics of my expertise (*Detail of the letter. See Appendix B for the full text*).

After sending the initial letters, we waited for 3 months and compiled the answers. Follow-up emails were sent only if the recipients asked for clarification. After that, we conducted qualitative content analysis on the collection of the answers. For the data analysis, we followed Braun and Clarke (2006) on the deployment of thematic analysis. We structured the data analysis in six different phases (familiarization with data, generation of initial codes, searching for possible themes, reviewing these initial themes, defining the main narratives, and drafting the results). After the main narratives emerged, we discussed and analyzed these narratives with two independent scholars.

Results

Descriptive statistics

First, we measured the participation of top performing scholars in the analyzed communication departments by different indicators. The first group of indicators show the mean of the amount of SciVal top ranked scholars within communication departments (Table 2). For example, on the average, only 3% of staff members are listed among the TOP500 scholars in the group of established scholars, and only 0.1% are ranked as TOP30 in the same group. The second group of indicators show the mean share of departments with at least one scholar listed on SciVal rankings (Table 3). For instance, 41% of the departments have at least one SciVal TOP500 scholar in both the ES and EM groups, but only 3% of the departments have TOP30 scholars in the ES group. Finally, the third group of indicators relate to the total share of SciVal ranked scholars in our sample from the full SciVal list (Table 4). For example, in the ES group, 36% of all the SciVal TOP500 ranked ES scholars are affiliated with one of our analyzed departments, and this amount is 50% for the TOP50 EM list.

Table 2 The first block of indicators that describe the amount of SciVal top scholars in communication departments

$N = 172$		Minimum (%)	Maximum (%)	Mean	*SD*
EM	Top 500	0	3.6	.0358	.0679
	Top 100	0	4.3	.0339	.0659
	Top 30	0	1.9	.0083	.0243
ES	Top 500	0	1.9	.0067	.0241
	Top 100	0	1	.0021	.0102
	Top 30	0	0.7	.0011	.0068

Table 3 The second and third blocks of indicators showing the share of the communication departments analyzed having the most productive scholars

	ES mean (%)	EM mean (%)
Mean of departments with at least one TOP500 faculty members	41	41
Mean of departments with at least one TOP100 faculty members	13	17
Mean of departments with at least one TOP30 faculty members	3	6
Total share of all the TOP500 scholars affiliated with one of the departments analyzed	36	40
Total share of all the TOP100 scholars affiliated with one of the departments analyzed	31	44
Total share of all the TOP30 scholars affiliated with one of the departments analyzed	23	50

Zero order correlations show that ranking positions correlate with the number of SciVal top scholars more significantly than with the number of faculty members, and the correlation is the strongest with the number of TOP500 scholars (Table 3). A strong correlation can be found between the EM and ES group in the case of all three SciVal categories (TOP500, TOP100, and TOP30). Obviously, the number of TOP500 scholars strongly correlates with the number of TOP100 and TOP30 scholars (as the latter categories are subsets of the former categories), and there is a significant correlation between the number of faculty members and the number of top scholars.

Addressing our hypotheses and research question

To test H1, linear regressions were calculated to predict ranking position based on the number of TOP500/TOP100/TOP30 faculty members in groups ES and EM. A significant regression equation was found for all three levels and both groups.

For the ES group:

[$F(1,170) = 17.29$ $p < 0.000$] with an R^2 of 0.09. Ranking position increased 8.41 for each TOP500 faculty member within the group of ES.

[$F(1,170) = 12.43$ $p < 0.001$] with an R^2 of 0.09. Ranking position increased 23.26 for each TOP100 faculty member within the group of ES.

[$F(1,170) = 5.23$ $p < 0.02$) with an R^2 of 0.03. Ranking position increased 38.15 for each TOP30 faculty member within the group of ES.

For the EM group:

[$F(1,170) = 17.72$ $p < 0.000$) with an R^2 of 0.09. Ranking position increased 6.95 for each TOP500 faculty member within the group of EM.

[$F(1,170) = 12.43$ $p < 0.001$) with an R^2 of 0.09. Ranking position increased 23.26 for each TOP100 faculty member within the group of ES.

[$F(1,170) = 6.22$ $p < 0.01$) with an R^2 of 0.03. Ranking position increased 25.13 for each TOP30 faculty member within the group of EM.

To test H2, a linear regression was calculated to predict ranking position based on the number of faculty members. A significant regression equation was found [$F(1,170) = 4.3$ $p < 0.04$] with an R^2 of 0.025. Ranking position increased 0.238 for each faculty

Table 4 Zero order correlations

		Ranking_position	Number_of_faculty_members	Number_of_TOP500_EM	Number_of_TOP500_ES	Number_of_TOP100_EM	Number_of_TOP100_ES	Number_of_TOP30_EM	Number_of_TOP30_ES
Ranking_position	Pearson Correlation	1	.157*	.307**	.303**	.227**	.261**	.188*	.173*
	Sig. (2-tailed)		.040	.000	.000	.003	.001	.014	.023
	N	172	172	172	172	172	172	172	172
Number_of_faculty_members	Pearson Correlation	.157*	1	.395**	.415**	.248**	.197**	.276**	.242**
	Sig. (2-tailed)	.040		.000	.000	.001	.009	0	.001
	N	172	172	172	172	172	172	172	172
Number_of_TOP500_EM	Pearson Correlation	.307**	.395**	1	.898**	.710**	.695**	.590**	.564**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	172	172	172	172	172	172	172	172
Number_of_TOP500_ES	Pearson Correlation	.303	.415**	.898**	1	.638**	.661**	.501**	.471**
	Sig. (2-tailed)	.000	.000	.000		.000	0	0	.000
	N	172	172	172	172	172	172	172	172
Number_of_TOP100_EM	Pearson Correlation	.227**	.248**	.710**	.638**	1	.772**	.851**	.791**
	Sig. (2-tailed)	.003	.001	.000	.000		.000	.000	.000
	N	172	172	172	172	172	172	172	172
Number_of_TOP100_ES	Pearson Correlation	.261**	.197**	.695**	.661**	.638**	1	.739**	.683**
	Sig. (2-tailed)	.001	.009	.000	.000	.000		.000	.000
	N	172	172	172	172	172	172	172	172
Number_of_TOP30_EM	Pearson Correlation	.188*	.276**	.590**	.501**	.851**	.739**	1	.862**
	Sig. (2-tailed)	.014	0	.000	.000	.000	.000		.000
	N	172	172	172	172	172	172	172	172

Table 4 continued

		Ranking_position	Number_of_faculty_members	Number_of_TOP500_EM	Number_of_TOP500_ES	Number_of_TOP100_EM	Number_of_TOP100_ES	Number_of_TOP30_EM	Number_of_TOP30_ES
Number_of_TOP30_ES	Pearson Correlation	.173*	.242**	.564**	.471**	.791**	.683**	.862**	1
	Sig. (2-tailed)	.023	.001	.000	.000	.000	.000	.000	
	N	172	172	172	172	172	172	172	172

*Correlation is significant at the .05 level (2-tailed)

**Correlation is significant at the .01 level (2-tailed)

Table 5 Regression analysis predicting ranking positions

Predictors	Ranking position β main effects
Number of faculty members	0.157*
Top 500	
EM	0.307***
ES	0.303***
Top 100	
EM	0.227**
ES	0.261***
Top 30	
EM	0.188*
ES	0.173*

Standardized regression coefficients (β) reported. Sample size = 172; *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed)

Table 6 Regression analysis predicting the number of emerging scholars (EM) in a given department

Predictors: ES	EM β main effects
Top 500	0.898***
Top 100	0.772***
Top 30	0.862***

Standardized regression coefficients (β) reported. Sample size = 172; ***$p < .001$ (two-tailed)

member. Therefore, H2 was supported. Standardized regression coefficients are reported below (Table 5).

To test H3, a linear regression was calculated to predict the number of TOP500/100/30 EM based on the number of TOP500/100/30 ES. A significant regression equation was found in each case:

$[F(1,170) = 708.31\ p < 0.000]$ with and R^2 of 0.8. The number of TOP500 EM increased 1.1 for each TOP500 ES.
$[F(1,170) = 250.87\ p < 0.000]$ with and R^2 of 0.59. The number of TOP100 EM increased 1.050 for each TOP100 ES.
$[F(1,170) = 492.57\ p < 0.000]$ with and R^2 of 0.74. The number of TOP30 EM increased 1.42 for each TOP30 ES. Standardized regression coefficients for H5 are reported below (Table 6).

To test H4, we applied a Phi Coefficient measure and test of association. Preliminary crosstabulation showed that there are no expected counts less than 5, thus we could proceed with the Phi Coefficient measure and test of association.

Univariate analysis showed that there is a relatively balanced gender distribution in our sample with a solid male overrepresentation (male = 52.8, female = 47.2). However, as Table 7 shows, the proportion of the two genders amongst the most productive

Table 7 The share of the two genders amongst the most productive scholars

Most productive scholars	Count	Male	Female
TOP 500	Count	148	120
	Expected count	132	106
TOP 100	Count	34	18
	Expected count	27.5	24.5
TOP 30	Count	13	2
	Expected count	7.9	7.1

scholars seems to be unbalanced, and especially on the level of the 30 most productive scholars, the share of females is much lower than expected.

The test of association, however, shows that the association between gender being among the most productive scholars is statistically significant ($p < 0.005$) only in the top-30 pool, but the Phi Coefficients suggest that, even in this case, there is only a negligible association. Therefore, we can accept the null hypothesis that there is no association between gender and whether a scholar is listed among the most productive scholars. Therefore, H4 was not supported (Table 8).

To address our research question (Q1) we made a thematic analysis of the responses to our inquiry in which our experimental researcher (ER) offered to collaborate with the departments of our sample.

From the 172 initial emails we sent, there one was undeliverable, and three of the addressees sent back an auto reply, saying that they were on leave. We received 48 answers (28%), while the number of unanswered letters was 120 (70%). After the initial coding and a recurrent search for the main themes we found four typical narratives in the response letters. All answers were—to a different extent—negative: not even conditional bids were offered. None invited the experimental researcher for a personal interview, and there were no requests for further information. Rejections were justified by four narratives, but these were not strictly delimited and, in most cases, overlapped with one another.

Table 8 Phi Coefficient measure and test of association between being amongst the most productive (TOP 500, TOP 100, and TOP 30) scholars and gender

Most productive	Association (Gender/most productive, Chi-square)		
	Value	df	Sig
TOP500	3.149	1	0.079
TOP100	3.320	1	0.068
TOP30	6.911	1	0.009

	Symmetric measures			
	Phi		Cramer's *V*	
	Value	Sig	Value	Sig
TOP500	− 0.022	0.076	0.022	0.076
TOP100	− 0.023	0.068	0.023	0.068
TOP30	− 0.033	0.009	0.033	0.009

The first and most frequent narrative was that there are no open positions at the department, and that even if there would be, these are always advertised on various professional sites such as jobs.ac.uk or the online platforms of the relevant scholarly associations such as the National Communication Association or the International Communication Association. In some cases, this narrative also included a mention that the department was not in a financial position to hire researchers, and a few department chairs also added that they only invite scholars with whom they had previously collaborated in some form. This narrative was, in most cases, expressed in a simple and formal way, but there were a few more informal responses as well:

> "Hi there. As you might imagine, we get many requests from folks who want to come to beautiful XXX to visit but we have limited capacity for visitors, so we reserve those spots for people who are active collaborators of our faculty already." (Respondent 21)

The second narrative explained that there were no researcher positions at the department at all, because the department is either teaching-oriented, or the workload is divided between teaching and research duties. It is noteworthy, however, that no one asked whether the experimental researcher was willing to teach as well. In one case, it was a requirement to teach in the local language (other than English). Sometimes the researcher was advised to apply to research institutions and not university departments. In some cases, direct links to these research institutions were attached to the response letter.

> "I appreciate your interest in joining our Faculty. I comment that the tasks are essentially teaching. However, I have your request in mind." (Respondent 33)

According to the third, rather frequent narrative, departments were subject to a hiring freeze due to COVID.

> "Thank you for reaching out to the XXX. Your background and experience are impressive but unfortunately at this time we are experiencing a hiring freeze that prohibits us from considering visiting researchers. If the situation improves, I'll be in touch or feel free to contact me again in the future." (Respondent 12)
> "We are hiring less given the financial position due to COVID." (Respondent 28)

Finally, in the fourth type of narrative, departments were interested, but did not want to provide funding, and typically made one of two offers: either the researcher was asked to apply for a grant (typically ERC or Marie Skłodowska-Curie Actions) with the corresponding department as host institution, or the researcher was asked to apply for a non-funded guest professorship—despite the initial letter explicitly stated that funding was essential for the researcher. It is noteworthy that 66% of offers came from Asian countries, and 33% from Western Europe.

> "It's undeniable that you have an impressive publication record, but I'm afraid we don't have any (paid) research or teaching positions available at this time. The only thing I can think of is an application for a Marie Curie or ERC grant, have you considered those?" (Respondent 11)
> "Thank you for reaching out. In case you don't already know, we have the Visiting Scholar scheme. Details, including the requirements, can be found here: XXX. Feel free to browse through our faculty list and obtain confirmation from a faculty member who is able to collaborate with you during your stint here. We'll then take it from there. All the best. (Respondent 31)"

In summary, all responses can be considered as formal rejections of the researcher's proposal.

Discussion and conclusion

According to the Standard Model of Productivity (Fig. 1), recruitment should be based on the potential of the candidates (Cook, 2009; Evers et al, 2005). After the candidate with the supposed potential was selected, the department provides the appropriate infrastructural environment, working conditions and academic culture that will enhance the scholar's productivity (Canagarajah, 2002). This enhanced productivity would lead to better positions on global rankings, which would boost the interests of both international students and research funders (Pietrucha, 2018). The standard model also supposes that the potential of candidates can be predicted by their education, thus recruitment—especially in the case of junior positions—is based on the prestige of the doctoral school, and past productivity is only of secondary importance (Herschberg et al., 2018). However, the assumption whereby the prestige of candidates' PhD school is predictive of future productivity is not supported by considerable empirical evidence (Williamson & Cable, 2003).

This paper offers five contributions to our existing knowledge on the use of scientometric indicators in the process of academic recruitment as it is related to ranking positions. Moreover, contrary to the widespread acceptance of the standard model of productivity, our study offers an alternative model that can be used to further enhance productivity.

First, while SciVal is a relatively new tool for assessing productivity and impact (Wen et al., 2020), our results show that the number of SciVal ranked faculty members positively correlates with the corresponding department's position on the QS World University Ranking. This is due to the fact that—similarly to other university rankings—QS works with Scopus data when assessing the scholarly output of university departments. Our regression models predict that the number of top ranked scholars is associated with the position of the departments on global rankings, thus, theoretically, SciVal proved to be an effective tool for recruitment decisions.
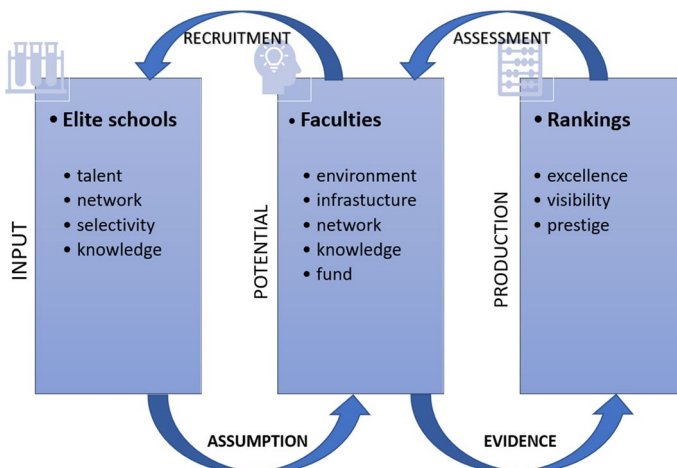

Fig. 1 The standard model of productivity

Our second finding shows that both departments and the most productive scholars are—either explicitly or implicitly—aware of the relation between top scholars and top departments. Forty percent of the analyzed 172 departments have at least one scholar from the list of TOP500 scholars, and a significant part of the top scholars are employed by top universities. This finding strengthens the assumption that the relationship between faculty members' productivity and university ranking positions is acknowledged by departments, which try to attract productive scholars. On the other hand, top universities might provide ideal work conditions for their faculty members that can result in higher productivity.

However, we also found opposite trends between the emergent and the established scholar groups. For established scholars, the more productive they are, the less likely they are to be affiliated with one of the top departments. While 36% of all the top 500 scholars in the ES group are affiliated with the departments analyzed, this share decreases to 31% in the top 100, and to 23% in the top 30 group. As opposed to this trend, the more productive a scholar in the EM group is, the more likely they are to be affiliated with top universities. In this group, the share of top 500 scholars affiliated with the departments we studied was 40%, a share which grew to 44% in the top 100, and to 50% in the top 30 group. A tentative explanation for this phenomenon could be that the emerging emphasis on research excellence (Antonowicz et al., 2017) and university rankings (Pietrucha, 2018) in the last few years has made departments more interested in appealing to the most productive scholars (Kaiser & Pratt, 2016), and this new generation of scholars is also aware of their own value. We can reasonably suppose that they apply for positions in top departments on purpose, suggesting that their productivity will be valued. In contrast to emerging scholars, established academics are supposedly affiliated with their departments for a longer time, and they might not change their positions as flexibly as emerging scholars who presumably do not yet have a strong commitment to their departments.

Our third contribution relates to the finding that, while top departments have a significant number of highly productive scholars, there is still room for improvement. In other words, there is an apparent scarcity in top scholars. For example, only 3% of all the departments have TOP30 scholars from the ES group, and only 6% of the departments have TOP30 scholars from the EM group. On the staff level, only 3% of faculty members are listed on the TOP500 ranking, and only one in a thousand are listed amongst the TOP30. In other words, while departments try to employ productive scholars, 60% of the departments we studied had no SciVal ranked researchers, and 97% of faculty members are not listed on SciVal at all. Since our results show that the involvement of the most productive scholars significantly associated with the position of departments, we can conclude that departments with top positions on university rankings invest more in attracting the best ranked scholars. Our numbers show that the scarcity of top scholars is significantly higher than the supply. For example, only the half of the TOP30 scholars in the EM group are free to be recruited by top departments, while 94% of these departments have no TOP30 scholars, and the average chance for a department member to be a TOP30 scholar is only one in a thousand.

Our finding that a significant part of SciVal listed authors can be found on both the ES and EM lists is our fourth contribution, and we argue that this fact further strengthens the assumption of the literature by which the importance of productivity grows over time (Antonowicz et al. (2017). From the total of 251 scholars listed on the EM and ES rankings, 127 researchers (51%) appear in both groups. This means that the importance of those scholars who were excellent in the last 10 years and who have maintained their rate of productivity over the last 4 years is very high. Thus, the fact that we measured a greater share of top scholars in EM than in ES in all ranking groups (especially in the groups of TOP30

scholars) can be explained in two ways. First, it is possible that even the most productive scholars are pressured to be more productive, thus those scholars who were included in the ES group of TOP500 scholars became TOP100 or TOP30 members in the EM group. However, we found only a slight difference between the number of scholars whose position worsened (115) and those whose performance improved (136). Obviously, these numbers alone cannot explain, for example, why 50% of all the TOP30 scholars are employed at the top departments in the EM group, while the proportion of affiliated TOP30 scholars is only 24% in the ES group. Thus, we might reject this assumption and turn to the second possible explanation stating that differences between the share of ES and EM groups are defined by the new entrants. Based on our evidence, it is reasonable to say that productivity is now valued more highly than it was a few years ago, thus departments recruit more highly productive emerging scholars than before.

Our empirical results suggest that there is no statistically significant association between gender and the likelihood of being listed among the most productive scholars. The analyzed departments were close to balance in terms of the amount of male and female scholars, and while male scholars are over-represented among the most productive scholars on all the analyzed levels, the gender difference is either not significant or the effect of association is minimal. Consequently, we did not apply gender as a determining factor in our Model of Maximum Productivity.

Finally, our last contribution is related to our qualitative experiment. We found that productivity alone is not enough for obtaining a position or funding: even in those limited cases when our experimental researcher's offer was positively appreciated, the scholar was either invited only as non-funded guest professor or was asked to apply for an external grant. Several facts can explain this finding. Departments argued that they lack the financial or institutional flexibility for recruiting excellent scholars on contract, because they can only recruit through their competitive systems when open positions are available, and these calls are widely advertised. However, we can assume that if any of the departments in the study had really wanted to acquire the benefits that a TOP30-ranked scholar can offer, they might have found a way to start a promising dialogue. Thus, while we recognize that, normally, universities recruit in their usual fashion (Herschberg et al., 2018), we also assume that decision makers are not totally aware of the direct connection between productivity and university rankings or the limited supply of SciVal top ranked researchers. It is also noteworthy that Asian universities—while in a non-funded form—were significantly more interested in cooperation than Western departments. The experimental researcher was invited to four Asian and two Western European universities as a guest professor, but received no invitations from the US, the UK, Australia, or Canada. Out of the 12 Asian departments in the sample (See Appendix A), 33% invited the experimental scholar, while this ratio was minimal for Western Europe, and zero for other parts of the world.

Based on our findings, we constructed the Model of Maximum Productivity (Fig. 2), which contests some of the assumptions of the standard model.

Despite an apparent scarcity of top scholars, institutions do not typically make every possible effort to recruit the most productive researchers. This might be related to the assumptions of the standard model which recognizes that rankings are based on productivity but does not structure recruitment accordingly (Pietrucha, 2018). This assumption is based on another belief whereby elite education provides the best scholars (Cook, 2009), thus future productivity can be predicted by education (Evers et al, 2005). However, there is a great volume of empirical evidence refuting this assumption: the best predictor for future performance is past performance, and not education trajectory (Győrffy et al., 2020; Kaiser & Pratt, 2016; Williamson & Cable, 2003). Moreover, as Demeter (2019) argues, if
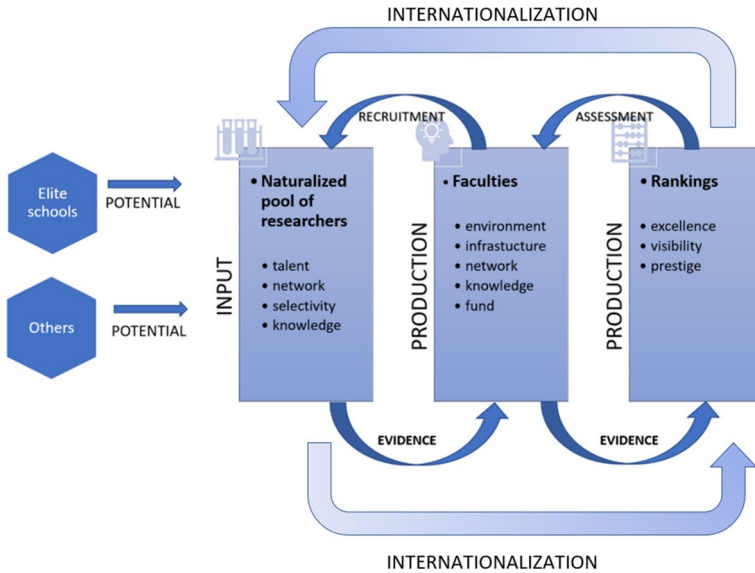
Fig. 2 The model of maximum productivity

elite schools really train the best scholars, then this distinguished quality should be manifested in productivity. Thus, it is more reasonable to assess productivity instead of education history. In addition, according to the standard model, recruitment is based on potential and assumption, and not on production and evidence. With our Model of Maximum Productivity, the recruitment process—similarly to ranking processes—is totally based on evidence. Based on the assumption that education and training should result in productivity, our model suggests that academic institutions would do better to recruit from a naturalized pool of candidates, where education trajectory is less important than productivity. In this manner, they could recruit the most productive scholars, whose performance would be further enhanced by the optimal academic environment offered by elite departments, and which would lead to better ranking positions for those universities. Finally, institutions may have to make their current rigid and formal institutional recruitment practices more flexible. Since it is unlikely that the small number of top researchers can monitor the open calls of all departments that may be considered, it is most likely that these researchers will end up with institutions that are able to adapt to the increasingly competitive field with more flexible recruitment procedures or who directly headhunt the most productive scholars.

Limitations and future research directions

This study has some limitations and several lines of possible extension that should be addressed by future research. First, other university rankings such as the ARWU and THE use different assessment protocol and, for scientometric analysis, they use different datasets. Future research should analyze whether our associations between productivity and ranking positions hold when we expand the analysis for other university rankings. In these studies, we also have to change Scopus and SciVal to the Web of Science and InCites, since

several rankings such as the ARWU or the CWTS Leiden Ranking works with Web of Science data.

Second, different university rankings, besides publication record, have other specific components of evaluation such as internationalization, the professor/student rate, or the perceived prestige of the university by a related group of scholars and students. While the number of publications can be the sole criterium (like in the case of the CWTS Leiden Ranking), the emphasis on publication in assessment procedure varies between different rankings. Measurable research production contributes to ranking positions in itself, and it also influences other indicators such as citations and prestige. Still, we admit that publication record does not determine ranking position, but yet it still has a considerable effect on them. However, future research should introduce other variables for testing the association between the researcher profile of faculty members and departmental rank.

Third, different universities might place a different level of emphasis on research in general, and on university rankings in particular. Other scholarly duties such as teaching, curriculum development, conference organization and administration can play a significant role in recruitment, so our findings and the recommended model mostly relate to research universities where the primary focus is research excellence.

Fourth, our research did not consider country differences. While our analysis contains departments from four continents and from a wide set of countries, there can be important differences between recruitment strategies across countries. Thus, future qualitative studies should extend our analysis by analyzing those aspects of recruitment policies that have local or regional characteristics.

Finally, as our research considered productivity as an independent variable, we did not analyze factors that have an influence on productivity. There is an extensive literature that discusses possible structural inequalities that have an effect on publication success, such as gender, nationality, seniority or language, so future research that focuses on the preconditions of research production can further extend our Model of Maximum Productivity, taking the prerequisites of research productivity as independent variables. However, the suggested extended model would have several methodological difficulties as, unlike research output, citation count or ranking position, most of the aforementioned structural features are hard to quantify.

Appendix A

The list of universities in our sample, ordered by QS 2020 positions

1	University of Amsterdam
2	University of Southern California
3	LSE
4	Stanford University
5	University of Texan and Austin
6	University of Pennsylvania
7	Goldsmiths, University of London
8	Nanyang Technological University
9	University of California, Berkeley
10	New York University
11	University of Wisconsin-Madison

12	National University of Singapore
13	University of California, Los Angeles (UCLA)
14	Columbia University
15	The Chinese University of Hong Kong
16	Michigan State University
17	Queensland University of Technology
18	University of Zurich
19	Northwestern University
20	University of Michigan, Ann-Arbor
21	The University of Sydney
22	University of California, Santa Barbara
23	Cardiff University
24	Massachusetts Institute of Technology
25	King's College London
26	Ludwig-Maximilians-Universitat München
27	The University of Hong Kong
28	University of Leeds
29	The Ohio State University
30	University of Vienna
31	University of Westminster
32	Yale University
33	University of Illinois at Urbana-Champaign
34	Cornell University
35	Pennsylvania State University
36	Aarhus University
37	The University of Melbourne
38	City University of Hong Kong
39	University of North Carolina, Chapel Hill
40	University of Copenhagen
41	University of Leicester
42	McGill University
43	Seoul National University
44	RMIT University
45	University of Missouri, Columbia
46	Freie Universitaet, Berlin
47	The University of New South Wales
48	University of Washington
49	University of Oslo
50	University of Helsinki
51	CITY University of London
52	CITY University of New York
53	Fudan University
54	The Hebrew Uni of Jerusalem
55	Hong Kong Baptist University
56	Humboldt-universitat zu Berlin
57	Indiana University Bloomington
58	KU Leuven

59	Korea University
60	Loughborough University
61	Lund University
62	Monash University
63	National Taiwan University
64	Peking University
65	Pontificia Universidad Catolica dr Chile
66	Purdue University
67	Royal Holloway University of London
68	Simon Fraser University
69	SOAS University of London
70	Stockholm University
71	Sungkyunkwan University
72	Syracuse University
73	Tampere University
74	The University of Auckland
75	The University of Queensland
76	The University of Sheffield
77	The University of Tokyo
78	The University of Warwick
79	Tsinghua University
80	Computense University de Madrid
81	University of Navarra
82	Universidad Nacional Autónoma de México
83	Universidad de Sao Paulo
84	Université de Montréal
85	University of Antwerp
86	University of California San Diego
87	University of Florida
88	University of Groningen
89	University of Illinois at Chicago
90	University of Iowa
91	University of Minnesota Twin Cities
92	University of Technology Sydney
93	Uppsala University
94	Utrecht University
95	Vrije Universiteit Amsterdam
96	Vrije Universiteit Brussel
97	Western Sydney University
98	Yonsei University
99	Arizona State University
100	Brown University
101	Deakin University
102	George Washington University
103	Hanyang University
104	Johannes Gutenberg Universitat Mainz
105	Johns Hopkins University

106	Kyoto University
107	Macquarie Universit
108	National Chenchi University
109	RWHT Aachen University
110	Rutgers University-New Brunswick
111	The University of Georgia
112	University of Milan
113	Alma Mater Studiorum-University of Bologna
114	Universitat de Barcelona
115	Universitat Hamburg
116	Universite de Québec
117	University Paris-Sorbonne
118	Universiti Kebangsaan Malaysia (UKM)
119	University of Alberta
120	The University of Arizona
121	University of Bergen
122	University of California, Davis
123	University of Colorado Boulder
124	University of East Anglia
125	University of Hawai at Manoa
126	University of Iowa
127	University of Massachusetts Amherst
128	University of Southern Denmark
129	University of York
130	Victoria University of Wellington
131	Waseda University
132	Westfalische Wilhelms Universitat Munster
133	York University
134	Zhejiang University
135	Curtin University
136	Dublin City University
137	Ewha Womans University
138	Florida State University
139	George Mason University
140	Georgtown University
141	Georgia Institute of Technology
142	La Trobe University
143	Lomonosov Moscow State University
144	Ohio University
145	Radboud University
146	Rhodes University
147	Roskilde University
148	Sapienza University of Rome
149	Sahnghai Jiao Tong University
150	Texas A&M University
151	The University of Adelaide
152	The University of Western Australia

153	University of Granada
154	Universidade Federal do Rio de Janeiro
155	University Cattolica del Sacro Cuore
156	Universitat Leipzig
157	University Sains Malaysia
158	University at Buddalo SUNY
159	The University of Alabama
160	University of Calgary
161	University of Gothenburg
162	University of Kansas
163	University of Miami
164	University of Oklahoma
165	University of Otago
166	University of Pittsburgh
167	University of South Carolina
168	University of South Florida
169	University of Stirling
170	University of Tartu
171	University of Waikato
172	University of Wollongong

Appendix B

The full letter sent to the chairs of the communication departments involved in the sample (anonymized)

Dear professor <chair name>,

My name is <researcher name>, and I am a researcher in communication and media studies. As a result of my continuous efforts over the last 3 years, I am ranked as the <rank> most productive researcher in Europe, and <rank> worldwide, according to SciVal—the leading international scientific assessment system working with Elsevier's Scopus. My papers were published in the leading high-profile journals of the field such as <journal name>, <journal name>, >, <journal name>, >, <journal name>, >, <journal name> and>, <journal name>. I have attached my researcher profile, which shows my publication record.

I am currently seeking a research position (ideally, working as half-time non-residential researcher, though I am open to other opportunities as well) at a leading institution of my field that will support my work both with funding and with interactions with faculty having common research interests. I can contribute to the advancement of the institution through the publication of my papers, and by joining existing research teams on topics of my expertise. My substantial research in the fields of <research field name>, <research field name>, and the <research field name>, would be particularly relevant in the context of the Institution's strong tradition in these fields.

I look forward to hearing from you,

<Researcher name>

<Researcher email>

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