MAREK KWIEK

8. INEQUALITY IN ACADEMIC KNOWLEDGE PRODUCTION

The Role of Research Top Performers across Europe

INTRODUCTION

This paper focuses on the inequality in academic knowledge production and finds the productivity distribution patterns across European systems to be strikingly similar, despite starkly different national academic traditions. The upper echelons of highly productive academics (the upper 10 percent of academics who are ranked highest in terms of their publishing performance in 11 European countries) provide, on average, almost half of all academic knowledge production.

The primary data analyzed comes from the large-scale global CAP and European EUROAC research projects on the academic profession ("Changing Academic Profession" and "Academic Profession in Europe"), with 13,908 usable cases of research-involved academics. In particular, the data studied in this paper refer to a subpopulation of highly productive academics (N = 1,583), contrasted with a subpopulation of 90 percent of the remaining academics (N = 12,325). If a research question can be "the theoretical or empirical puzzle that motivates a given study" (Brady & Collier, 2010: 347), then our study was motivated by the puzzle of the impact of highly productive academics on overall European publishing output.

In short, the inequality in academic knowledge production in Europe is as follows: about 10 percent of academics – termed research top performers here – produce on average almost half (45.9 percent) of all articles, and 20 percent produce two-thirds of them (65.4 percent). The remaining 80 percent of academics produce on average only about one third of all articles (34.6 percent). If the research-active segment of the European academic profession is divided into two halves, the upper most productive half produces almost all the articles (94.1 percent), and the lower most productive half produces less than 6 percent. From a gender perspective, the proportion of male academics among research top performers is higher (three out of four) than that of female academics but "productivity concentration indexes" for both genders (linking the percentages of male and female top performers to the percentages of all male and all female academics in national systems) clearly show that the role of highly productive female academics is much higher than traditionally assumed in the literature on social stratification in science.

E. Reale & E. Primeri (Eds.), The Transformation of University Institutional and Organizational Boundaries, 203–230.

This paper provides another, this time large-scale and cross-national, corroboration of the systematic inequality in knowledge production, for the first time argued for by Alfred Lotka (1929) and Derek de Solla Price (1963). We show here that the traditional stratification of the academic profession based on different publishing patterns still holds across Europe. While it is important to "measure science" (Irvine & Martin, 1984), following the advent of a new "metric of science" (Elkana et al.,1978) through sophisticated bibliometric tools (Leydesdorff, 2001), we argue that it is still useful to refer to traditional survey-based individual productivity analyses to explore both the "what" of academic knowledge production and the "why" of it (individual and institutional predictors of high research performance).

The corroboration for systematic social stratification and academic inequality in science is one line of research, pursued here. Through a combination of descriptive and inferential analyses, in an accompanying paper (Kwiek, 2015b) we explore highly productive academics as a distinctive segment of the European academic profession. European research top performers, as discussed there, are a highly homogeneous group of academics whose high research performance is driven by structurally similar factors. They work according to similar patterns, they share similar academic attitudes, and the general research productivity literature applies to them only to a limited extent. Highly productive academics are similar from a cross-national perspective and likewise substantially differ intra-nationally from their lower-performing colleagues. They are more highly cosmopolitan, more fundamentally hard-working, and more substantially research-oriented than the remaining academics, despite differentiated national contexts.

This paper is organized as follows: the next section is "Analytical Framework" (with subsections on "research productivity", "the quality-quantity dilemma in productivity studies" and "gender and research performance"). Section 3 is focused on "Data and Methods" and includes two subsections on "the dataset used" and on "research top performers vs. the rest of academics". The core of the paper is in section 4, "Research Findings", divided into four subsections: "research top performers and the national research output", "a brief statistical profile", and two subsections on the gender distribution of research top performers. Finally, section 5 presents "Discussion" and Section 6 "Conclusions".

ANALYTICAL FRAMEWORK

Research Productivity

Faculty research productivity and its predictors have been thoroughly explored in the academic literature, mostly in single-nation contexts (especially the USA, the United Kingdom, and Australia: see Cole & Cole, 1973; Allison & Stewart, 1974; Fox, 1983; Ramsden, 1994; Shin & Cummings, 2010), and rarely in cross-national contexts (see Teodorescu, 1994; Drennan et al., 2013). While most studies did not use national samples and focused on faculty from selected academic fields, especially from the natural sciences, our study used national samples and refers to all academic fields grouped in five large clusters.

So far, international higher education comparative studies have not explored highly productive scientists; and though they have been mentioned in passing in various single-nation academic profession studies (for instance, Crane, 1965; Cole & Cole, 1973; Allison, 1980), they were not researched in any detail either quantitatively or qualitatively in these studies (exceptions include a discussion of "big-output writers" or "big producers" in *Little Science, Big Science* by Derek J. de Solla Price (1963), a foundational book for scientometrics; a study of "star scientists" in the context of sex differences in research productivity in Italy in Abramo, D'Angelo and Caprasecca 2009; and studies of productivity of nationally-listed "eminent scientists" in Croatia in Prpić, 1996).

Thus highly productive academics as a separate segment of the academic profession are a very rare scholarly theme. We assume that because about one tenth of European academics produce about half of all research output (and one in twenty produces about a third of it), this distinct academic population deserves more scholarly attention.

We do not explore in this paper the larger issue of "academic productivity" which would combine both "research productivity" and "teaching effectiveness", as in John A. Centra (1983) and in Herbert W. Marsh and John Hattie (2002), which would allow us to study what James S. Fairweather (1999) termed "the complete faculty member" through faculty teaching and faculty research productivity combined. We explore *research* productivity only, defined here, following Daniel Teodorescu (2000: 206) in his influential comparative study of ten countries based on the Carnegie dataset (a predecessor of the CAP/EUROAC dataset), as the "self-reported number of journal articles and chapters in academic books that the respondent had published in the three years prior to the survey". Our study thus explores both intra-national and cross-national differences in academic productivity between the research top performers and "average" (Stephan & Levine, 1992: 57–58) academics within and across national systems. It explores research top performers working across a long continuum of national systems, from the lowest-performing (Poland) to the highest-performing (Italy and the Netherlands, followed by Switzerland and Germany, see Kwiek, 2015a) in terms of average publishing output.

The Quality-Quantity Dilemma in Productivity Studies

We do not argue in this paper that the number of publications (here: journal articles and book chapters, excluding books) is the best way to measure academic research productivity for cross-national comparative purposes; also no link is made between publications and their value, current or future (as normally no link is made between citations and their value, now or in the future), or between publications and the prestige of publication journals. Consistently with prior research on publication productivity, we assume, following Mary Frank Fox (1983: 285), that the principal means of communication in science is the publication process, "it is through publication that scientists receive professional recognition and esteem, as well as promotion, advancement, and funding for future research". "Recognition" in science comes from "scientific output" (Cole & Cole, 1967) and the reward system in science is designed to give recognition and esteem to those scientists who have best fulfilled their roles: in Robert K. Merton's (1973: 297) formulation, "the institution of science has developed an elaborate system for allocating rewards to those who variously lived up to its norms". Publications and citations increasingly matter and, in general, as Jerry Gaston (1978: ix) put it in his book on reward systems, the question is "whether or not people get what they deserve". Academics publish their work in exchange for scientific recognition: as Warren O. Hagstrom (1965: 168) formulated the idea in his theory of social control in science, "recognition is given for information, and the scientist who contributes much information to his colleagues is rewarded by them with high prestige". Consequently, research productivity studies are at the heart of studies on the academic profession.

On the basis of the CAP/EUROAC dataset used in this paper, only the self-reported number of publications for the past three academic years prior to the survey date could be used. There were no technical opportunities to combine the number of publications with the number of citations for either the total sample of 13,908 European research-involved academics, or for the 1,583 subsample of research top performers. The anonymization of all eleven national datasets prior to their merger into a single European dataset precludes any study of correlations based on both academic production and its impact measured through citations (as can be done separately for some national systems with specific datasets, usually resulting from various national research assessment exercises: see e.g., a study by Abramo, D'Angelo, & Caprasecca, 2009; Abramo, D'Angelo, & Di Costa, 2011 for an entire population of Italian academics).

The quality-quantity dilemma in academic productivity studies based on publication numbers is not easy to solve. This paper follows the explicit assumption that more productive academics produce more articles and less productive academics produce fewer articles – but no link is made here to either the originality of journal articles or their current or future impact in academic disciplines or beyond them, in science or beyond it, in the wider society. Consequently, from among the four ideal types of academic research production (based on both quantity and quality of published research) suggested by Jonathan R. Cole and Stephen Cole (1973: 91–93) for physicists in their study of social stratification in science – "prolific", "perfectionists", "mass producers" and "silent" – our study tends to focus on the "prolific" segment in which academics are defined by both the high quantity and high quality of their publications. As Cole and Cole (1973: 111) argued, "since quality and quantity of research output are fairly highly correlated, the high producers *tend* to publish the more consequential research. … engaging in a lot of research is in one sense a 'necessary' condition for the production of high-quality work". Also Paula E. Stephan and Sharon G. Levin argue (1991: 364) that the prolific scientists they studied have not "traded quality for quantity by publishing in journals which have lower impact". Or, finally, as Price (1963: 41) argued along similar lines, "although there is no guarantee that the small producer is a nonentity and the big producer a distinguished scientist, there is a strong correlation". Our study uses the most comprehensive cross-national academic profession dataset currently available, with all its inherent limitations (widely reported in the last two decades, following 1994 when a benchmark for such datasets was produced in a global Carnegie study of the academic profession. For a discussion on the limitations of this type of dataset and the limitations of the resulting comparative research, see Teichler, Arimoto, & Cummings, 2013: 35).

Gender and Research Performance

This study also explores gender differences in research productivity and the gender distribution of research top performers. From a gender perspective, early differences in motivation between male and female academics can have far-reaching consequences for their productivity rates in the future: as Cole and Cole argued (1973: 150–151), even receiving the doctorate may have a qualitatively different meaning for male and female academics. Historically, until a few decades ago, while for male academics, PhD degrees may have been just entry cards to the academic profession, for female academics to have earned the degree was "in some measure, a triumph". In some countries, and Poland is the best example, only a minority of women entering the academic profession (as studied through the category of "new entrants", or those holding the degree for no more than 10 years) show a preference for research, compared with the majority of men entering the profession. Polish women academics in the "new entrants" category show the lowest research interest across all the systems studied (Kwiek, 2014a). Consistent with the accumulative advantage theory (Allison et al., 1982; Allison & Stewart, 1974), and even more so, consistent with what the Coles referred to as the reinforcement of research activity by the reward system, an early lack of success leads to smaller chances of later scientific success. This is the darker side of the accumulation of rewards in science – it is "the accumulation of failures – the process of 'accumulative disadvantage'" (Cole & Cole, 1973: 146). Productivity is heavily influenced by the recognition of early work and consequently, as the Coles argue:

> if women fail to be as productive in the years immediately following their degree, the social process of accumulative disadvantage may take over and contribute to their falling further behind in the race to produce new scientific discoveries. (Cole & Cole, 1973: 151)

In other words, as Jonathan R. Cole (1979: 8) argued in *Fair Science. Women in the Scientific Community*, the skewed distribution of scientific productivity and of subsequent rewards also results from "the poor getting poorer": "the growing inequality between the 'haves' and 'have-nots' of science results in part from a decline in productivity among those scientists who started their careers as moderately productive researchers, while the elite remain moderately or highly prolific researchers. Potentially, this process can influence the careers of women scientists".

While the "glass ceiling" for women in science appears to have already been broken (Cummings & Finkelstein, 2012: 76 in a US context), globally, "academic men have better academic networks and use them more often" and "the traditional gender differences in academic work seem to be reproduced through international academic activities" (Vabø et al., 2014: 191, 202). As there is a strong correlation between internationalization in research and individual research productivity (as we have shown for the same 11 European systems, Kwiek, 2015a; see Abramo et al., 2011 for Italy), the research productivity of female academics – who are generally more "internationalized at home" but less "internationalized abroad" than male academics – is more affected by the mounting pressures of internationalization than that of male academics. Not surprisingly, based on the CAP data, Michel Rostan, Flavio A. Ceravolo, and Amy Scott Metcalfe (2014: 130) conclude that "the prototypical academic figure in international research collaboration is a man, in his mid-50s or younger, working as a professor in a field of the natural sciences at a university in a small, non-Asian and non-English speaking country with a mature economy". The gender gap in research productivity continues (Padilla-Gonzáles et al., 2012: 275) and gender differences and inequalities still remain, with "the permanence of some barriers to women's careers" (Goastellec & Pekari, 2013: 76). In general, though, sex differences in productivity are "not immune to social change": while women academics used to publish at "50–60 percent" of the male academic rate, now they do so at around "70–80 percent" rate, as Yu Xie and Kimberlee A. Shauman conclude in their *Women in Science. Career Processes and Outcomes* (2003: 182–183) in a US context. The reasons for what Cole and Zuckerman (1984: 218) termed "the productivity puzzle", as explored through a systematic multivariate approach, are as follows:

> Women scientists publish fewer papers than men because women are less likely than men to have the personal characteristics, structural positions, and facilitating resources that are conductive to publication. There is very little *direct* effect of sex on research productivity. ... Women and men scientist are located in different academic structures with different access to valuable resources. … Once sex differences in such positions are taken into account … net differences between men and women in research productivity are nil or negligible. (Xie & Shauman, 2013: 191–193)

The implications for the scientific productivity of both male and female academics in the Coles' cumulative advantage and reinforcement theories are clear, as Stephan and Levin (1992: 29) emphasize:

> Success breeds success. Consequently, those who enjoy success continue to be productive throughout their lives; those who have less success become discouraged and eventually look to other pursuits for satisfaction.

DATA AND METHODS

The Dataset Used

The data used in this study are drawn from eleven European countries involved in both the CAP and EUROAC projects (Austria, Finland, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Switzerland, and the United Kingdom), subsequently cleaned and weighted in a single European dataset by a University of Kassel team.[1] The combined CAP/EUROAC dataset is the most comprehensive source of cross-national data on European academics (see the wide panorama of research themes explored using this dataset in the last three years: Shin, Arimoto, & Cummings, 2014 on “teaching and research”; Locke, Cummings, & Fisher 2011 on “governance and management”; Huang, Finkelstein, & Rostan, 2014 on “internationalization”; Teichler & Höhle, 2013 on “work situation”; Bentley et al., on “job satisfaction”; Teichler, Arimoto, & Cummings, 2013 on “the changing academic profession”, from the long list of cross-national and single-nation studies available). The quality of the data is high (Teichler, Arimoto, & Cummings, 2013: 35; Teichler & Höhle, 2013: 9).

A survey questionnaire was sent out to the CAP countries in 2007 and to the EUROAC countries in 2010. The total number of returned surveys was 17,211 and included between 1,000 and 1,700 returned surveys from all the countries studied except for Poland where it was higher, as shown in Table 1 in the Appendices. Overall, the response rate differed from over 30 percent (in Norway, Italy, and Germany), to 20–30 percent (in the Netherlands, Finland, and Ireland), to about 15 percent in the United Kingdom, 11 percent in Poland and 10 percent or less in Austria, Switzerland and Portugal. The relatively low response rates may be caused by the increasing number of surveys to which the academic profession is routinely exposed (Mesch, 2012: 316 ff.). There are no indications that the pool of respondents differs from the pool of non-respondents, though, and consequently the “non-response bias” (Stoop, 2012: 122) does not seem to occur. The Polish subsample of 3,704 academics is a special case: it is highly representative of the population of about 79,000 Polish academics, even though the response rate for Poland was 11.22 percent. Overall, simple random sampling, systematic sampling, and stratified random sampling methods were used, depending on the country. In Poland, the sampling method of an “equal probability of selection method” (Hibberts et al., 2012: 55) was used: every element in a sample (every Polish academic) having an equal chance of being selected for the study. In contrast, in Germany, Switzerland and Austria, cluster sampling methods were used, with the pre-selection of some institutions.

Individual data files were produced by all participating countries but all specifically national categories (faculty rank structures, institutional type structures etc.) were reduced to internationally comparable categories. An international codebook was created and a number of coding modifications were introduced into national data files, in particular the dichotomization of all faculty into "senior" and "junior" faculty and into faculty employed in "universities" and those employed in "other higher education institutions". The data cleaning process included the use of "survey audits" prepared by national teams. In the process of international data coordination, sample values were weighted so that national samples in the countries studied were broadly representative of national academic populations for most independent variables, especially gender, academic field, institutional type and institutional rank (national-level sampling techniques are described for the CAP European countries in RIHE, 2008: 89–178; Teichler, Arimoto, & Cummings, 2013: 30–35; Huang, Finkelstein, & Rostan, 2014: 23–36; and for the EUROAC countries in Teichler & Höhle, 2013: 6–9). The distribution of faculty by academic field cluster is shown in Table 2 in the Appendices.

Research Top Performers vs. the Rest of Academics

The sample of European academics studied here has been divided into two complementary subsamples: academics reporting research involvement and academics reporting *not* being involved in research. Then the first subsample was divided into two subgroups: the first being "research top performers" identified as academics ranked among the top 10 percent of academics with the highest research performance in each of the 11 national systems (separately) and in all five major research field clusters (also separately).[2] The second subgroup being that of the remaining 90 percent of academics involved in research.

The distribution of the sample population by country is shown in Table 3 below; and includes the number of surveys usable in the current research (i.e., with all relevant data), surveys of the academics involved in research activities (N), the share of academics involved in research activities, surveys of research top performers, and the share of research top performers in the sample population of academics involved in research (assumed to be about 10 percent, data cut-off points permitting). What is especially important is the cross-national differences in the share of academics involved in research activities across national systems: at one extreme, in some countries (e.g., Poland and Italy) almost all academics surveyed reported being involved in research (about 98–99 percent, and in Norway about 90 percent); at the other extreme, in other countries (e.g., the Netherlands and the UK), only about half of the academics surveyed reported being involved in research. The remaining seven countries are somewhere in the middle, with the mean for all eleven countries being about 80 percent. The survey instrument was used to study the academic profession in general rather than merely its research-involved subgroup. No research involvement being reported both in the university and non-university ("other higher education institution") sectors. In more diversified systems, academics from the non-university sector constituted a higher proportion of respondents, with the Netherlands and the UK as prime examples. The non-university sector involves for instance *hogescholen* in the Netherlands, *Fachhochschulen* in Germany, and *statlige høgskoler* in Norway; only in Italy and Austria were no other institutional types other than universities represented in the sample.

Table 3. The distribution of the sample population, by country

	All Academics	*Research-involved Academics (N)*	*% Research-involved Academics*	*Research top performers*	*% Research top performers*
Austria	1,492	1,297	86.9	146	11.3
Finland	1,374	1,063	77.4	126	11.9
Germany	1,215	1,007	82.9	110	10.9
Ireland	1,126	865	76.8	101	11.7
Italy	1,711	1,674	97.8	191	11.4
Netherlands	1,209	536	44.3	61	11.4
Norway	986	876	88.8	106	12.1
Poland	3,704	3,659	98.8	411	11.2
Portugal	1,513	944	62.4	104	11.0
Switzerland	1,414	1,210	85.6	138	11.4
UK	1,467	777	53.0	89	11.5
Total	17,211	13,908	80.8	1,583	11.4

RESEARCH FINDINGS

Research top performers give substance to European research production: in a word, without them, it would be halved. Because, consistently across all the European systems studied, on average, slightly less than half (46 percent) of all academic research production as measured by journal articles comes from about 10 percent of the most highly productive academics. And in four systems, the share is near or exceeds 50 percent (Austria, Finland, Poland, and Portugal), see Table 4 below.

Specifically, in a representative European sample of 17,211 academics from 11 systems, a subsample of about 1,583 highly productive academics (Derek J. de Solla Price's "big-output writers of scientific literature" and "large producers", and the Coles' "scientific frontiersmen") produced 32,706 out of 71,248 journal articles

Table 4. Journal articles (and book chapters) produced in the three-year reference period, by research top performers and the remaining academics, by country

	By top performers	*By the rest*	*Total*	*% by top performers*
Austria	3,330	1,206	4,536	73.4
Finland	2,445	2,435	4,880	50.1
Germany	2,702	3,506	6,208	43.5
Ireland	2,419	2,684	5,103	47.4
Italy	5,096	10,162	15,259	33.4
Netherlands	1,513	1,647	3,160	47.9
Norway	1,902	2,340	4,243	44.8
Poland	6,767	6,831	13,599	49.8
Portugal	1,992	1,952	3,945	50.5
Switzerland	2,798	3,304	6,102	45.9
UK	1,740	2,475	4,215	41.3
Total	32,706	38,543	71,248	45.9

(or 45.9 percent) in the three-year period studied (and the upper 5 percent of highly productive academics produced on average 33 percent of all journal articles).

Research Top Performers and the National Research Output

There are powerful linkages between academic cultures (the "tribes") and disciplinary knowledge (their "territories"), and an individual's powerful sense of belonging to his or her academic tribe (Becher, 1987; Becher & Trowler, 2001). Not surprisingly, there are substantial cross-disciplinary differences in the share of the research output among top performers in the total research output of the systems studied (Table 5 below): the highest level of concentration is discernible in engineering as well as in the physical sciences and mathematics; and the lowest for the humanities and social sciences as well as for life sciences and medical sciences (see "field means"). For instance, in Finland and Germany, about 60 percent of all articles in engineering are produced by top performers. In general, our findings for Norway – a system with the lowest cross-disciplinary variation in the share of output produced by top performers – are consistent with Svein Kyvik's (1989: 210) study of Norwegian academics in which no essential differences in publishing inequality across academic fields were reported. The only country that does not fit the general European pattern is Italy: the share of output by its top performers in total output is markedly smaller than in other countries (at about one third), and it is highly differentiated by academic fields. This deviation can be explained by Italy having the highest academic productivity index and the highest productivity index for articles (Kwiek, 2015b) so that the difference between top performers and the rest of academics is lower than elsewhere (Abramo et al., 2009: 143 have shown that 12 percent of highly-performing Italian academics produce about 35 percent of total academic production as seen through the Science Citation Index, compared to 33.4 percent produced by 11.4 percent of academics derived from the dataset we use; also the male and female concentration indexes for Italy are exactly the same. Italy is the only European system for which comprehensive data on top performers are available, and the convergence of research results for this country tends to support high levels of reliability for the research results found in this paper).

Table 5. Average research output (= total number of articles in 3 years) of research top performers as a share of national research output, by disciplines, for all countries (in percent).

Fields / Countries	*FI*	*DE*	*IE*	*IT*	*NL*	*NO*	*PL*	*PT*	*CH*	*UK*	*Field mean*
Life sciences and medical sciences	50.9	39.2	45.8	31.5	51.0	44.7	48.5	49.2	41.4	36.6	43.9
Physical sciences, mathematics	44.1	53.3	46.1	29.4	45.7	42.5	61.2	54.3	47.6	54.2	47.8
Engineering	61.5	58.5	49.7	38.8	52.6	47.2	55.8	52.2	49.5	49.1	51.5
Humanities and social sciences	43.3	38.5	49.6	41.4	40.8	41.8	43.3	45.4	48.1	34.0	42.6
Professions	47.5	48.0	44.7	32.9	52.7	45.1	45.8	57.4	50.3	41.0	46.5
Country mean	50.1	43.5	47.4	33.4	47.9	44.8	49.8	50.5	45.9	41.3	

In short, from among all research-active academics in Europe (from both university and non-university sectors, employed both full-time and part-time), about 10 percent are the most productive academics who produce almost half (45.9 percent) of all articles, with 20 percent producing two-thirds of all articles (65.4 percent). The remaining 80 percent produce only about one third of all articles (34.6 percent). If the research-active European academic profession is divided into two halves, the upper most productive half produces almost all published articles (94.1 percent), with the lower most productive half producing less than 6 percent.

If we focus on a specific subsample of European academics; those who are research-active and employed full-time in universities only; the emergent picture is only slightly different. The upper most productive 10 percent produce about four in every ten articles (41.5 percent) and the upper 20 percent produce about six in every ten articles (61.2 percent). The remaining 80 percent produce less than four in every ten articles (39.8 percent). And if the research-active European academic profession employed full-time in universities is divided into two halves, the upper most productive half produces more than 90 percent of all articles (91.5 percent), and the lower most productive half produces less than 9 percent.

RESEARCH TOP PERFORMERS: A BRIEF STATISTICAL PROFILE

We have explored the differences between research top performers and the remaining 90 percent of academics through eight dimensional groupings. Some of them were linked in the research literature as factors influencing individual research productivity, others were not. In general, they are either individual or institutional. The dimensional groupings are as follows: demographics, socialization, internationalization, academic behaviors, academic attitudes and role orientation, overall research engagement, institutional policies, and institutional support.

An analysis of the descriptive statistics for the two subsamples demonstrates that there are a number of universal characteristic patterns that hold for research top performers in all eleven systems studied (we studied multi-dimensional relationships which require a model approach, using a regression analysis, see Kwiek, 2015b). There are also very strong patterns holding in all systems but one.

The universal patterns regarding European research top performers are the following:

- being a male academic (that is, in all systems, the share of male academics is higher among research top performers than the share of female academics) (*demographics*),
- higher mean age (in all systems, the mean age of research top performers is higher than the mean age of the rest of academics),
- being employed full-time (in all systems, the share of full-time employed academics is higher among research top performers than among the rest of academics) (*demographics*),
- being a professor (*demographics*),
- collaborating internationally, collaborating domestically, publishing in a foreign language, and conducting research that is international in scope or orientation (*internationalization*),
- viewing research as reinforcing teaching (*academic attitudes and role orientation*),
- being research-orientated, viewing scholarship as original research, and viewing scholarship as basic/theoretical research (*academic attitudes and role orientation*),
- sitting in national/international committees/boards/bodies, being a peer reviewer, and being an editor of journals/book series (*overall research engagement*), and, finally,
- writing research grant proposals.

In terms of the major groupings of characteristics, the strongest universal patterns are discernible in four of them: demographics, internationalization, academic attitudes and role orientation, and overall research engagement (4 characteristics in each). In contrast, there are no universal patterns discernible in the other four remaining clusters: socialization, academic behaviors, institutional policies, and institutional support. In view of previous research on academic productivity, it is especially surprising in the case of the socialization and academic behaviors groupings, as the institutional characteristics from the two institutional groupings are commonly believed to be less relevant to academic productivity than individual characteristics (Teodorescu, 2000; Drennan et al., 2013).

In most systems research top performers are on average more research-oriented than the remaining academics by about 30 percentage points; they collaborate internationally more often by about 20 p.p. (and domestically by about 30 p.p.), publish in a foreign country more often by about 20 p.p., sit on national and international boards and committees more often by about 30 p.p., are peer reviewers more often by about 40 p.p., are editors of journals/book series by about 20–30 p.p., and write research grant proposals more often by about 20–30 p.p. (Table 6 below).

RESEARCH TOP PERFORMERS: A GENDER DISTRIBUTION

The gender differential in academic productivity rates and the gender stratification in science are highly important issues from the perspectives of public policy (Leathwood & Read, 2009; Fitzgerald, 2014) and equity as well as women's status in higher education (Allan, 2011). They are also, undoubtedly, hot political issues. Our research shows that, consistently across Europe, the distribution of research top performers by gender is skewed towards male academics: their share is on average 2–5 times higher than the share of female academics (there are only three exceptions to this rule: in the UK, their share is much lower, in Germany it is lower, and in Portugal the gender difference is marginal). However, is there a consistent gender distribution among research top performers across Europe?

The mere *share* of women among top performers is not a fair measure. To explore the inequality in academic knowledge production along gender lines, a more sophisticated measuring instrument is needed. Following Abramo et al. (2009: 143) who focused on "star scientists" in Italy, we have constructed a similar "productivity concentration index" for all European countries, for both genders.

The concentration index is a "measure of association between two variables" based on frequencies data and varying around the neutral value of 1: the percentage of male top performers divided by the percentage of all male academics in a given system, or the share of male academics among top performers divided by the share of male academics among all academics. "The index of concentration, equaling 1.60, indicates that the relative frequency of this profile among star scientists is over 60% greater than the frequency of the same profile in the entire population" (Abramo et al., 2009: 143–144). That is, in the case of male academics from the

Table 6. Various personal and institutional characteristics linked to individual research productivity, all countries: research top performers (T) vs. the remaining academics (R); universal characteristics only (and those for all countries with one exception (+). In some cases, in percent "agreement", we refer to percentages of answers 4 and 5 (or 3 and 4) combined, on a five-point (four-point) Likert scale, depending on the question.

Items / Countries (%)	*AT*		*FI*		*DE*		*IE*		*IT*		*NL*		*NO*		*PL*		*PT*		*CH*		*UK*	
	T	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*
Female (yes)	33.8	38.7	30.8	43.0	16.2	34.1	30.5	48.9	17.8	33.9	21.5	50.1	20.8	32.7	23.9	41.2	35.9	46.0	25.7	44.0	21.4	38.4
Mean age (years)	46.9	40.8	48.7	43.0	50.6	43.0	47.0	44.2	52.5	52.0	50.1	46.2	47.2	46.3	54.2	46.3	48.3	47.9	47.4	42.3	46.3	37.6
+Job satisfaction (4 & 5)	64.8	63.7	78.0	66.0	70.0	56.4	61.0	56.7	69.7	63.8	57.2	44.2	80.0	76.5	66.3	68.7	71.7	61.3	57.7	50.5	83.6	70.9
Full-time	82.8	66.6	91.4	81.9	91.6	71.5	95.0	92.1	96.3	96.9	97.1	85.4	85.7	63.5	95.2	89.7	98.6	97.8	95.1	90.0	77.1	57.7
Professor	8.5	4.8	44.8	8.3	34.0	5.2	32.7	6.7	43.8	29.2	40.1	8.2	41.9	8.1	69.5	18.3	16.5	6.3	9.4	1.8	31.6	6.3
Collaborating internationally	68.2	61.7	88.4	67.8	82.9	57.5	82.2	59.4	89.4	75.5	85.2	66.0	88.6	57.9	80.4	54.0	75.8	61.1	77.1	63.8	83.1	65.9
Collaborating domestically	91.7	74.4	98.7	67.8	72.4	42.8	99.0	69.7	81.2	56.6	90.8	58.0	85.7	49.4	86.8	57.4	64.4	45.0	74.9	49.1	91.0	63.3
Publishing in a foreign country	92.8	81.5	92.0	69.1	80.3	62.7	93.0	73.7	81.4	65.9	73.5	53.6	0.0	0.0	92.4	73.5	78.2	51.8	96.8	65.8	92.0	66.1
Research international in scope	80.7	62.0	80.9	57.0	63.5	49.9	77.8	66.2	88.3	72.7	84.5	60.5	83.0	59.9	77.8	65.1	53.6	36.9	82.2	48.1	75.0	55.7
Research-oriented (3 & 4)	82.0	78.6	93.9	76.1	81.4	67.5	92.0	54.4	91.4	74.6	97.0	69.8	93.5	67.3	94.6	82.6	81.9	55.7	78.0	46.8	84.5	77.6

(Continued)

Table 6. (Continued)

Items / Countries (%)	*AT*		*FI*		*DE*		*IE*		*IT*		*NL*		*NO*		*PL*		*PT*		*CH*		*UK*	
	T	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*	*T*	*R*
Research reinforces teaching	85.3	80.4	87.3	77.7	83.7	63.4	87.4	87.2	88.6	81.7	88.7	77.6	82.4	83.2	89.6	81.2	60.1	47.9	90.4	72.2	83.3	64.6
Scholarship is original research	81.2	71.7	76.3	60.6	80.0	68.8	73.3	71.1	78.1	72.5	79.9	68.1	83.6	75.3	95.4	87.4	74.5	67.8	84.6	69.1	0.0	0.0
Basic/theoretical research	72.1	70.2	72.4	55.1	64.1	57.0	64.6	48.6	61.4	56.6	69.8	52.0	54.2	51.7	69.7	67.5	62.0	57.8	50.1	41.5	46.5	43.7
National/ international committees	64.8	33.7	53.1	19.1	32.5	11.3	75.0	48.9	70.2	49.9	58.2	23.3	73.0	26.7	73.2	30.3	33.8	15.4	44.5	26.1	84.7	42.0
A peer reviewer	82.0	57.3	86.3	35.1	50.1	21.0	99.0	69.1	77.7	53.2	92.9	64.6	94.3	45.4	89.4	43.9	68.5	39.5	69.2	30.5	88.3	41.7
Editor of journals/book series	62.2	30.6	38.7	10.7	43.7	12.2	34.0	20.0	19.0	8.6	47.5	17.7	42.3	16.8	33.6	8.3	9.8	6.4	27.0	9.6	51.6	12.8
+ Involved in technology transfer	15.3	11.0	37.8	30.4	31.7	14.2	9.9	11.0	22.9	13.1	26.6	15.8	32.1	12.1	19.4	10.0	9.9	8.9	24.1	13.4	31.9	21.5
Writing research grant proposals	81.9	59.0	82.7	59.2	89.3	54.0	49.5	45.3	86.0	69.2	83.2	62.8	81.8	55.3	97.2	74.0	69.0	56.3	55.2	19.1	83.8	48.0
+ Research equipment (4 & 5)	52.1	45.1	59.6	53.5	54.6	52.9	64.7	54.6	36.9	29.7	44.4	38.4	58.9	38.6	39.5	52.3	36.4	34.1	36.4	30.8	72.5	70.8

Note: In three cases; Italy, "full-time" and "mean age", and the Netherlands, "research reinforces teaching"; the difference of less than 1 percent was disregarded.

UK (Table 7 below), the productivity concentration index of 1.5 for male academics shows that the relative frequency of male research top performers among all research top performers is 50 percent higher than the frequency of male academics among all academics. Similarly, in the case of female academics from the UK, the productivity concentration index of 0.5 for female academics shows that the relative frequency of female research top performers in all research top performers is 50 percent lower than the share of female academics in all academics.

Universally, across all systems, male productivity concentration indexes are higher than 1 (from 1.1 in Austria to 1.5 in the UK) and female productivity concentration indexes are lower than 1 (from 0.5 in Germany and the UK to 0.9 in Austria). Male academics are over-represented among top performers, and female academics are under-represented. In other words, what matters is not only the gender distribution of top performers, as shown in the "frequency" line in Table 7 below (and the *share* of male top performers, ranging from two-thirds to four-fifths) but also the *relative* presence of male and female academics in the subpopulation of research top performers as measured by a productivity concentration index by genders, as shown in the "concentration" line in the same table. The concentration of men among top performers is precisely twice that of the concentration of women among top performers in Italy, Norway, Switzerland (1.2 vs. 0.6) and it is slightly lower in Finland, Ireland, the Netherlands, and Poland. It is the lowest in Austria, and the highest in the UK, with a male concentration three times higher.

In the context of the traditional sociology of science and social stratification literature (Wilson, 1995; Hagstrom, 1965; Merton, 1973; Cole & Cole, 1973; Zuckerman, 1996), these research results strongly support the argument of the historically growing role of female academics in academic knowledge production: in almost all countries studied, the difference between the *relative* presence of male and female academics in the subpopulation of research top performers is by a factor of only two. In the emerging, consistent patterns of inequality in knowledge production, the high role of women academics among the upper echelons of highly productive academics is undeniable. The gender productivity gap among research top performers (and the under-representation of female academics in this group) is clearly lower than expected.

There is a long list of caveats here, though, leading to reservations of various natures. We will focus on two. First, the research production data in this paper is self-reported and male academics in some systems may tend to overestimate the number of articles they produce, while female academics may tend to underestimate the number. In other words, different national academic cultures may lead to different levels of overestimation and underestimation of research production contingent on the gender factor. Second, the various systems studied here are differently populated by female academics in general (20–50 percent), and by female academics in the university sector in particular (15–55 percent). Also, there are gender-based choices of research problems, of academic disciplines, and of research styles; including publication patterns, and matters relating to research productivity. Robert Leslie

Table 7. Gender distribution of top performers by country (numbers and percentages), for all countries. The productivity concentration index is the percentage of male top performers/divided by the percentage of male researchers in a given country; the same applies to female top performers.

Items / Countries	*AT*		*FI*		*DE*		*IE*		*IT*		*NL*		*NO*		*PL*		*PT*		*CH*		*UK*	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
Number	87	44	87	39	89	17	66	29	156	34	45	12	80	25	257	144	74	26	107	29	58	16
Frequency	66.2	33.8	69.2	30.8	83.8	16.2	69.5	30.5	82.2	17.8	79.2	20.8	76.1	23.9	64.1	35.9	74.3	25.7	78.6	21.4	78.5	21.5
Concentration	1.1	0.9	1.2	0.7	1.2	0.5	1.3	0.7	1.2	0.6	1.2	0.7	1.2	0.6	1.2	0.8	1.3	0.6	1.2	0.6	1.5	0.5

Fisher argues (2005: 275) that differences in research styles (for instance, publishing less frequently) between men and women scientists may be linked to the issue of women being "latecomers to the academic world":

> women scientists are keenly aware that their work is regarded more skeptically than men's research. Women scientists understand that not only men in their discipline may be looking more critically at research by women scientists. Women colleagues will also be quick to condemn the low quality work of women scientists. This is because these colleagues are afraid that poor quality work by women will provide ammunition to those hostile to women in the discipline.

Not surprisingly, our research shows that female academics already in the top academic ranks are often on average more productive than men in the same ranks, work longer total weekly hours, longer weekly research hours, and are more research-oriented: to reach the highest levels of recognition, they had to survive in often hostile academic environments. But female academics in lower ranks often work on average shorter weekly research hours and show lower research engagement than male academics (for Poland, see Kwiek, 2014a).

"SUPER" RESEARCH TOP PERFORMERS: A FURTHER GENDER DISTRIBUTION

Giovanni Abramo and colleagues (2009: 145) in their study on the whole population of Italian academics show that "female star scientists are primarily concentrated in the lesser levels of productivity. … From lowest to highest frequency of production … there is an evident reversal of the sexes". To test this Italian conclusion on European academics, we have briefly explored a smaller group, a subsample of highly productive academics from its upper layer (termed here "super research top performers"). The group has been defined here arbitrarily as those who had published at least 28 journal articles in the three years prior to the execution of the survey. Super research top performers are a group of between 1.2–1.5 percent of academics in such countries as Poland, Portugal, and Finland; and between 3.3–4.6 percent in such countries as Germany, the Netherlands, and Italy, as shown below in Table 8.

Our research results clearly demonstrate that indeed the gender distribution among the upper layer of research top performers is heavily skewed towards male academics, as in the Italian case. Consequently, the productivity concentration indexes by gender for these two groups would be different from those shown in Table 7 above: they would be still higher for male academics and still lower for female academics belonging to the super research top performers. So the gender productivity gap increases in the upper layers of top performers (see Table 9 below): while the mean share of female academics among top performers in Europe is 25.3 percent, their mean share among super top performers decreases to 18 percent. Also, cross-national differences in gender distribution increase heavily. While for top performers, in only two countries is the share of female academics lower than 20

Table 8. Super top performers (those who published at least 28 papers within 3 years); by country, by gender, in %

	Super top performers		
	Percent of all academics	*Gender*	
		Male	*Female*
Austria	2.6	90.9	9.1
Finland	1.5	80.0	20.0
Germany	3.3	79.3	20.7
Ireland	2.3	78.9	21.1
Italy	4.6	83.4	16.6
Netherlands	3.5	91.1	8.9
Norway	2.0	83.7	16.3
Poland	1.2	82.3	17.7
Portugal	1.6	69.5	30.5
Switzerland	2.4	94.4	5.6
UK	1.7	68.8	31.2

percent (Germany and Italy), for super top performers it is lower than 20 percent in the majority of countries, and in three of them (Austria, the Netherlands and Switzerland), the share does not exceed 10 percent. In contrast, in three countries, the share of female academics actually *increases* among super top performers: these are Germany, Portugal, and the UK (in the last two reaching the highest levels in Europe and slightly exceeding 30 percent). In the majority of countries, the share of male academics increases by about 10–15 percentage points.

A more detailed cross-national analysis could be performed in selected academic disciplines, for instance life sciences and medical sciences on the one hand, and humanities and social sciences on the other (to see to what extent European universities might be disciplinarily-divided institutions, as explored at Polish universities in Kwiek, 2012; see Wanner et al., 1981), a path not followed here because of space limitations. The context for such an analysis could be the paths of academic careers across Europe becoming more volatile (Kwiek & Antonowicz, 2015) and the generally deteriorating working conditions in European higher education (Kwiek & Antonowicz, 2013).

DISCUSSION AND CONCLUSION

Our research clearly shows the validity across Europe of traditional generalizations according to which "only a small proportion of scientists produce the bulk of

Table 9. Top performers and super top performers; by gender (in percent)

	Top performers		*Super top performers*	
	Male	*Female*	*Male*	*Female*
Austria	66.2	33.8	90.9	9.1
Finland	69.2	30.8	80.0	20.0
Germany	83.8	16.2	79.3	20.7
Ireland	69.5	30.5	78.9	21.1
Italy	82.2	17.8	83.4	16.6
Netherlands	79.2	20.8	91.1	8.9
Norway	76.1	23.9	83.7	16.3
Poland	64.1	35.9	82.3	17.7
Portugal	74.3	25.7	69.5	30.5
Switzerland	78.6	21.4	94.4	5.6
UK	78.5	21.5	68.8	31.2
Mean	74.7	25.3	82.0	18.0

science which emerges from the scientific community" (Cole & Cole, 1973: 59). Academic knowledge production, in Europe as elsewhere, has always been highly stratified, "no matter how it is measured, there is enormous inequality in scientists' research productivity" (Allison, 1980: 163) because research productivity "varies enormously" (Fox, 1983: 286). Our study provides large-scale empirical support from 11 European systems to the conclusions from previous, usually single-nation and smaller-scale, research studies.

Based on the Carnegie dataset of the academic profession, Philip G. Altbach and Lionel S. Lewis (1996: 24) argued, without much further details, that "actual productivity is in fact limited to a minority of the profession". Paul Ramsden's (1994: 223) conclusions in his study of research productivity based on surveys of 890 academics from 18 Australian institutions were similar: "most publications are produced by a small proportion of the total number of staff". Also, Mary Frank Fox (1992: 296), based on surveys of 3,968 American social science academics, argued that "few people produce many articles and many publish few or none". Therefore our guiding research puzzle was as follows: is this the case across European systems too? Our findings consistently show that such productivity distribution patterns strongly hold for almost all European higher education systems and for all five major academic fields.

From a more historical perspective, our findings are consistent with the productivity patterns based on the estimations provided by Derek Price in the 1960s (in *Little Science, Big Science*, 1963) and Alfred J. Lotka's "The Frequency

Distribution of Scientific Productivity" (1926). The so-called "Lotka's law" (an inverse-square law of productivity) states that "the number of people producing *n* papers is proportional to 1/*n*2. For every 100 authors who produce a single paper in a certain period, there are 25 with two, 11 with three, and so on" (Price, 1963: 43). Or, as Cole and Cole argued in their study of American physicists (1973: 218), "using Price's model, we can estimate that roughly 50 percent of all scientific papers are produced by approximately 10 percent of the scientists". And this is exactly the case in Europe today: we certainly expected it but there has been no large-scale, cross-European empirical evidence to support the claim so far.

Consequently, our empirical findings show that there are different "academic professions" in European universities, with a small share of highly productive researchers and a large share of relatively middle to low productive academics. Cross-national similarities among highly productive academics are as strong as the intra-national differences between them and the remaining research-involved academics in their national systems; as we show in a parallel paper focused on academic behaviors, academic attitudes, and predictors of high research productivity (Kwiek, 2015b).

The academic profession in Europe is highly stratified: the upper 10 percent of highly productive academics are responsible for about a half of all academic production; and the upper 50 percent – for more than 90 percent. Among highly productive academics the concentration of women is stable across Europe, and relatively high when compared with a few decades ago. This paper revisits Alfred Lotka's "law" of the skewed frequency distribution of journal publications, revived by Derek Price, and confirms its unfading validity across Europe today. With the increasing role of individualized competitive research funding in most European higher education funding architectures (and at the European level, European Research Council grants), the role of research top performers in national systems is bound to increase in the future.

The distribution of academic knowledge production in Europe is highly skewed towards highly productive academics. The policy implications for this historically consistent pattern of research productivity are more important in systems in which research funding is increasingly based on individual research grants (such as Poland following the 2008–2012 wave of reforms, Kwiek, 2014b) than in systems with primarily institutionally-based research funding (such as Italy, Abramo et al., 2011), and are different for competitive and non-competitive systems in Europe (or with strong "up or out" vs. "once in – forever in" employment policies). A major emergent policy dilemma is whether to support more high-performing academics (wherever they are located) or highly-ranked institutions, with the option of concentrating high-performing academics in highly ranked-institutions, leading to a growing national research concentration in selected institutions only. Additionally, the tension between teaching and research is likely to increase in systems in which more competitive research funding systems are introduced (which some call "social Darwinism at its baldest", Thornton, 2012: 191).

Policy conclusions regarding knowledge production as viewed through the proxy of publishing articles and book chapters are perplexing: if European systems dismissed its top performers (the upper 10 percent of their research-active academics), they would lose on average about half of their national academic production. And if European systems dismissed the bottom half of their research-active academics in terms of research productivity, they would lose less than 6 percent of their national knowledge production (in the case of research active academics employed full-time in the university sector, the loss would be 8.5 percent).

Consequently, a new typology of the European academic profession emerges, based on the measurable contribution to knowledge production: in the research-active segment of the academic profession, there are research top performers, research middle performers (high-middle and low-middle), and research non-performers, or no-publishers. (These are the Coles' "silent scientists", whose share among full-time academics employed in the university sector ranges from less than 10 percent in Ireland, Italy, the UK and the Netherlands to more than 40 percent in Poland, see Table 10 in the Appendices). On top of that, both higher education institutions in general and universities in particular are populated by non research-active faculty, an additional segment of research non-performers. The academic behaviors and academic attitudes of research top performers are worlds apart from those of both middle performers and non-performers. And in terms of research productivity, there is no single "academic profession" (as has always been the case in the last half a century), only "professions" in the plural. "Academic professions" in the plural appear in a similar vein in Enders and Musselin (2008: 127) when they refer to the growing internal differentiation of the academic profession; in Marginson (2009: 110) when he summarizes the impact of globalization on the stratification "between those with global freedoms and those bound to the soil within nations or localities"; and in Teichler (2014: 84) when he explores the validity of the traditional Humboldtian teaching-research nexus in Germany and restricts it solely to a group of German "university professors". The growing stratification of academics across Europe is the name of the game in town, and the persistent inequality in academic knowledge production is one of its major dimensions.

We have explored in this paper a distinctive subgroup of highly productive academics from a cross-European comparative perspective to show the complexities inherent in the "academic profession" concept. The disaggregated picture of faculty research performance in Europe highlights a powerful divide between research top performers and the rest of academics which does not seem to have been studied so far from a European comparative perspective.

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NOTES

1 We worked on the final data set dated June 17, 2011 created by René Kooij and Florian Löwenstein from the International Centre of Higher Education and Research, INCHER-Kassel. The Polish research team also included Dr. Dominik Antonowicz who was chiefly responsible for the in-depth interviews with Polish academics.

2 We studied five major academic field clusters: "life sciences and medical sciences" (termed "life sciences" and "medical sciences, health-related sciences, social services" in the survey questionnaire), "physical sciences and mathematics" ("physical sciences, mathematics, computer sciences"), "engineering" ("engineering, manufacturing and construction, architecture"), "humanities and social sciences" ("humanities and arts" and "social and behavioral sciences"), and "professions" ("teacher training and education science", "business and administration, economics", and "law").

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APPENDICES

Table 1. Characteristics of the samples, by country

	Grand N	*Universities %*	*Other HE institutions %*	*Full-time %*	*Part-time %*
Austria	1,492	100.0	0.0	65.8	34.2
Finland	1,374	76.5	23.5	82.4	17.6
Germany	1,215	86.1	13.9	70.7	29.3
Ireland	1,126	73.3	26.7	91.2	8.8
Italy	1,711	100.0	0.0	96.9	3.1
Netherlands	1,209	34.4	65.6	56.0	44.0
Norway	986	93.3	6.7	89.7	10.3
Poland	3,704	48.3	51.7	98.0	2.0
Portugal	1,513	40.0	60.0	90.3	9.7
Switzerland	1,414	45.6	54.4	58.5	41.5
UK	1,467	40.8	59.2	86.5	13.5

* *In Austria and Italy there was no distinction between "universities" and "other higher education institutions".*

Table 2. Proportion of faculty, by academic field cluster and by country (in percent)

	Life sciences, med. Sciences	*Physical sciences, mathematics*	*Engineering*	*Humanities and social sciences*	*Professions*	*Other Fields*	*Total*
Austria	20.2	9.8	11.9	41.3	8.7	8.2	1,492
Finland	15.7	9.7	21.5	18.6	12.1	22.4	1,374
Germany	29.3	15.2	14.8	15.6	11.1	13.9	1,215
Ireland	23.0	11.5	8.8	23.8	20.5	12.4	1,126
Italy	28.6	23.3	11.1	17.5	13.6	5.9	1,711
Netherlands	12.6	10.9	10.7	22.3	34.7	8.8	1,209
Norway	29.0	14.1	7.4	27.5	8.9	13.1	986
Poland	24.6	8.4	21.5	23.0	12.5	10.0	3,704
Portugal	16.9	7.9	20.4	10.5	20.6	23.7	1,513
Switzerland	30.8	10.2	12.7	16.9	23.9	5.5	1,414
UK	21.9	11.6	6.3	18.6	11.0	30.7	1,467

Table 10. The percentage of non-performers (= non-publishers) regarding full-time academics, universities only, by country (in percent)

	FI	*DE*	*IE*	*IT*	*NL*	*NO*	*PL*	*PT*	*CH*	*UK*	*Mean*
Non performers	20.2	15.4	9.1	5.4	2.7	15.9	43.2	18.3	12.4	5.7	14.8

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