The Internationalization of the Academic Profession in Europe.

A Quantitative Study of 11 National Systems

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Abstract. This paper explores various aspects of the internationalization of the academic profession in Europe, using a micro-level (individual) approach which relies on the primary data collected in a comparable format from 17,211 European academics from 11 countries. It focuses, in particular, on 1) the patterns of internationalization of teaching, research, and publishing in hard vs. soft clusters of academic fields and on 2) the role of international research cooperation in individual research productivity. Research productivity and international publication co-authorship of "internationalists" and "locals" (or academics collaborating and not collaborating internationally) across Europe are compared. Finally, policy implications of the study for national research policies are briefly discussed.

Keywords: academic profession, internationalization, international research cooperation, individual research productivity, international publication co-authorship.

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1. Introduction

In this study of various aspects of the internationalization of the academic profession in Europe, we use amicro-level (individual) approach that relies on primary (as opposed to secondary) datacollected from European academics in a consistent, internationally comparable format. The individual academic, as opposed tothe national higher education system or the individual academic institution, is the unit of analysis. Anew "data-rich" research environment in international comparative academic profession studies created by two large-scale research projects (global CAP and European EUROAC projects on the academic profession: "Changing Academic Profession" and "Academic Profession in Europe: Responses to Societal Challenges", respectively) allows for the first time to analyze the internationalization of European academics in a comparative quantitative context and to analyze the links between the internationalization of research and re-

search productivity. The primary data analyzed in this paper comes from 11 European countries, with 17,211 usable cases.

There are two approaches to "measuring" the internationalization of a national higher education system. One approach is *external* to the system and relies on such secondary data as, for instance, national statistics on the input and output of higher education and academic research, the national composition of the academic faculty, and the level of internationalization of their various teaching and research activities. In particular, aggregated national academic research production can be compared internationally, using either international publication reports or international citation reports. The other approach is *internal* to a national higher education system and relies on academic behavioral and attitudinal data voluntarily provided by the academic faculty in a consistent, internationally comparable format. The former approach relies on aggregate macro-level national data, the latter on disaggregate micro-level data (that of individual academics). Both approaches are highly complementary. Until recently, due to the scarcity of reliable international data, only the former approach was used for international comparative quantitative purposes. Now, with new datasets (especially the CAP/EUROAC dataset used in this paper), the latter approach is beginning to be highly useful for both research and public policy objectives. In this paper, we shall therefore use the micro-level approach, restricting ourselves to the primary *quantitative* material collected by national research teams in 11 European countries, which has only indirect grounding in the accompanying large-scale *qualitative* material available from about 600 interviews with academic faculty conducted across Europe.

The data used in this study are drawn from 11 European countries involved in the CAP and EUROAC projects—Austria, Finland, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Switzerland, and the United Kingdom—subsequently cleaned, weighted, and integrated into a single European data set by the University of Kassel team[1]. The total number of returned surveys (in 2007 and 2010) was 17,211 (N=17,211) and included between about 1,000 and 1,700 surveys in all European countries studied except for Poland where it was higher (see Table 1). The distribution of the sample by clusters of academic fields is given in Table 2 below.

[1] The final data set dated June 17, 2011 and created by René Kooij and Florian Löwenstein from the International Centre of Higher Education and Research—INCHER-Kassel was used. The EUROAC project was coordinated by Professor Ulrich Teichler from INCHER and the CAP project was coordinated by Professor William Cummings from George Washington University. The Polish research team was led by the present author and also included Dr. Dominik Antonowicz, who was chiefly responsible for collecting qualitative material through 60 in-depth semi-structured interviews with Polish academics.

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Table 1. **Sample characteristics, by country**, in percent.

	N	Universities	Other HEIs	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
Total	17,211	—	—	—	—

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

Table 2. **Proportion of faculty by clusters of academic fields**, in percent.

	Life sci. and med. sci.	Physical sci., mathematics	Engineering	Humanities and soc. sci.	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

Individual data files were produced in 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 was introduced in national data files—in particular, the dichotomization of faculty into "senior" and "junior" faculty and into faculty employed in "universities" and 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 the national samples in the countries studied would be broadly representative of national academic populations for most independent variables, especially gender, academic fields, institutional types, and institutional ranks (national-level sampling techniques are described for the CAP European countries in [RIHE, 2008. P. 89–178], and for the EUROAC countries in [Teichler, Höhle, 2013. P. 6–9). Nevertheless, all problems and complexities of large-scale international collaborative empirical studies do apply (see especially [Teichler, 2014]).

For our analysis here, we have used a subsample of 9,536 (N(ftu)=9,536) European academics who were employed full-time (rather than part-time) in universities (as defined by national research teams in all the countries studied, rather than in "other higher education institutions").

2. Internationalization: a general overview

In terms of two demographic factors—being born abroad and being awarded a doctoral degree abroad—the European academic profession is highly internationalized. Only the internationalization of the Polish and Italian academics is substantially lower than in most other countries studied. Polish and Italian universities seem either not attractive enough or not open enough (or both) to foreign-born academics; their share in universities is merely 1.1 percent in Poland and 1.7 percent in Italy. Only in four countries (Poland, Italy, Finland, and Portugal) this share is lower than 10 percent. If we exclude the outlier cases of Poland and Italy, in the remaining 9 countries, on average, more than one in five academics is foreign-born (mean: 22.3 percent), with about half of academics in Switzerland (47.7 percent), about one-third in Ireland (33.7 percent), and one-fifth in Austria, the Netherlands, Norway, and the United Kingdom (see Table 3 below).

In terms of internationally awarded doctoral degrees, only in four European countries studied is the percentage of academics who were awarded their doctoral degrees in the country of their current employment above 90 percent (again Poland and Italy, as well as Germany and Finland). That percentage is highest in Poland, reaching almost 98 percent (97.6). In other words, only slightly more than two percent of Polish academics hold international doctoral degrees, compared

with about 47 percent of academics in Ireland and 40 percent of academics in Switzerland, as shown in Table 4 below.

In terms of research collaboration, in three countries (Poland, Germany, and Portugal) only about half of all academics collaborate internationally, with the highest share of such academics (about three-quarters) in such countries as the Netherlands, Austria, Ireland, Switzerland and Finland, as Table 5 below shows in more detail.

In more general terms, the thirteen variables from the CAP/EUROAC dataset deemed most relevant to internationalization have been selected (among them, three publication-related variables were used at two separate thresholds).From among all internationalization-related activities (or, in some cases, attitudes), at the aggregated European level, there are six that are clearly the most common (see Table 6 below).

As Table 6 below shows, between about half and two-thirds of all European academics (the mean percentage of the country means for the sample of 9,536) report publishing their works in a foreign language and putting emphasis on international perspectives or content in their courses. And in terms of research, the same share of them report collaborating with international colleagues in research, report their primary research to be international in scope or orientation, report publishing at least one-fourth of their publications in a foreign country and employing mainly English in their research. In addition, almost a half (47 percent) of all European academics published at least 50percent of their publications in a foreign country in the last three years prior to the survey. Additionally, more than one-fourth of European academics (27 percent) report co-authoring at least 25 percent of their publications with colleagues located in other countries and about 12 percent of them report co-authoring at least 50 percent of their publications with colleagues located in other countries. However, there is a powerful cross-country (see Table 6) and cross-disciplinary (see Table 8) differentiation in internationalization.

For the three publication-related variables of internationalization, two separate thresholds were used in the analysis: “at least 25 percent” and “at least 50 percent” of one’s academic works. The variables refer to publishing in a foreign country, publishing in a foreign language, and publishing works co-authored with international colleagues.

Specifically, in teaching-related activities, the most internationalized country is Switzerland and the least internationalized countries are Portugal and Germany. The percentage of academics who primarily use the English language in teaching varies from almost one-half in the Netherlands (46.8 percent) to only about 2–6 percent in Portugal, Italy, Germany, and Poland. More than one in five academics in Austria, Norway and Switzerland report teaching courses abroad, in contrast to less than one in ten in Portugal and Germany. While at least half of all academics report teaching any courses in a foreign lan-

Table 3. **Foreign-born academics, only academics employed full-time in universities, by country**, in percent.

PL	1.1	IR	33.7	PT	9.3
DE	15.3	IT	1.7	CH	47.7
AT	21.9	NE	22.8	UK	21.5
FI	8.8	NO	20.1		

Table 4. **Country of doctoral award, only academics employed full-time in universities, by country**, in percent.

	Country of current employment									
	PL	DE	AT	FI	IR	IT	NE	PT	CH	UK
Poland	97.6	0.1	0.1	0.4	0.2	0.0	0.0	0.0	0.2	1.8
Germany	0.3	93.3	13.4	0.4	1.9	0.6	4.0	0.4	15.3	2.5
Austria	0.0	1.6	79.5	0.2	0.4	0.1	0.0	0.0	1.0	0.3
Finland	0.0	0.2	0.0	90.1	0.0	0.0	0.0	0.0	0.3	0.0
France*	0.2	0.2	0.5	0.5	1.1	0.8	1.0	4.1	4.7	0.6
Ireland	0.0	0.0	0.0	0.2	52.9	0.1	0.2	0.0	0.0	0.3
Italy	0.3	0.1	0.3	0.0	0.8	91.5	1.1	0.4	3.1	0.9
Netherlands	0.0	0.1	0.3	0.2	0.4	0.5	82.3	0.7	1.1	0.4
Portugal	0.0	0.0	0.0	0.0	0.0	0.2	0.0	71.9	0.0	0.0
Russia*	0.4	0.0	0.1	1.1	0.2	0.1	0.2	0.0	0.0	0.0
Spain*	0.0	0.0	0.2	0.3	0.2	0.2	0.2	5.0	1.7	0.4
Switzerland	0.1	1.3	0.9	0.0	0.0	0.3	1.1	0.2	59.2	0.6
UK	0.0	0.3	1.3	1.8	30.0	2.4	2.4	9.2	3.9	83.7
USA*	0.3	1.9	2.0	1.5	9.1	2.3	2.7	4.7	4.1	3.7
Other*	0.9	0.9	1.6	3.3	2.7	0.7	4.8	3.4	5.4	4.9

* The table includes four major PhD granting countries relevant for the current sample (France, Russia, Spain, and the USA), as well as the category of "other" countries. Data for Norway are not available.

guage in Finland, Norway, and the Netherlands, only one-fourth or less of all academics report the same in Germany, Italy, and Portugal.

The cross-European picture is slightly different in research-related activities, including publishing. The least internationalized countries are Poland and Germany, and the most internationalized country is the Netherlands. Dutch academics report the highest level of research being international in scope or orientation, the highest level of collaboration with international colleagues in research (more than 80

Table 5. **National and international research collaboration** (percent stating "yes"). (Q D1: "How would you characterize your research efforts undertaken during this (or the previous) academic year?" "Do you collaborate with persons at other institutions in your country?" and "Do you collaborate with international colleagues?").

	Do you collaborate with persons at other institutions in your country?		Do you collaborate with international colleagues?	
	%	N	%	N
Poland	61.8	948	51.1	771
Germany	64.2	417	50.8	330
Austria	65.7	623	78.7	746
Finland	69.9	536	73.0	560
Ireland	64.4	396	79.7	490
Italy	77.9	1266	59.6	969
Netherlands	72.2	168	80.8	188
Norway	55.9	423	61.4	464
Portugal	63.6	218	52.2	179
Switzerland	74.2	259	75.4	263
UK	73.9	193	69.1	181

percent of academics in both categories), and the highest level (along with Switzerland) of the usage of English in research (about 75 percent). The Netherlands also scores very high in all publication-related parameters, in both lower and high intensity. In terms of long-term (at least two years) physical mobility, the two most internationalized countries are by far Italy (about half of all academics) and Switzerland (four in every ten academics). The lowest level is reported by Portuguese and German academics, the only two countries in Europe in which the share of internationally mobile academics is below 20 percent. The details are given below in Table 7.[2]

[2] As we have discussed elsewhere in more detail [Kwiek, 2014a], in most parameters, Poland scores below the European mean. In teaching, Poland is one of the three countries in which less than 60 percent of academics emphasize international perspectives or contents, together with Finland and Germany. In research, Poland is the only country in which less than one-half of academics indicate that their primary research is international in scope or orientation. Only slightly more than half of Polish academics report collaborating with international colleagues in research (compared with the European average of about two-thirds). The results for Poland are far better than expected, though, when publishing is concerned: low research orientation does not seem to lead to low international research production, with

Table 6. **European academics' engagement in various international activities, full-time academics employed in universities only, all countries combined** (some answers from 1 to 5 on a five-point Likert scale, combined answers 1 and 2, "strongly agree" and "agree", "very much" and "much"), sample size—9,536 academics, in percent.

The percentage of European academics...	%	N
publishing in a foreign language (>25%)**	64.6	4675
who emphasize international perspectives or content in their courses	64.0	4597
collaborating with international colleagues in research	63.8	5141
whose primary research is international in scope or orientation	63.1	4659
publishing in a foreign country (>25%)	59.7	4318
who employ in research primarily English	59.1	4064
publishing in a foreign language (>50%)	53.1	3845
publishing in a foreign country (>50%)	47.2	3417
teaching any courses in a foreign language	32.9	2588
publishing works co-authored with colleagues located in other countries (>25%)	27.2	1965
who spent in other countries since the award of their first degree at least two years**	25.8	1991
teaching any courses abroad	16.1	1269
whose research external funding comes from international organizations	15.0*	8886
publishing works co-authored with colleagues located in other countries (>50%)	12.4	895
who employ in teaching primarily English	11.9	793
whose most graduate students are currently international	8.1	592

* mean

** "foreign language" in all tables is used as an equivalent to "a language different from the language of instruction at the current institution"; "in other countries" is used as an equivalent to "outside the country of their first degree and current employment, "for the sake of brevity. Here and below, the UK and Ireland in some points are not analyzed due to the predominance of Anglophone journals and books in the channels of international research distribution.

strong disciplinary variations, as discussed below. Polish academics report the lowest share of intense publishing (more than 50 percent of their works) abroad; but in terms of less intense publishing (more than 25 percent of their work) abroad, they on average do better than both German and Italian academics. They also do relatively well in less intense publishing in a foreign language (at least 25 percent of their works)—they on average do better than German, Italian, Portuguese, Finnish, and Swiss academics. In the case of intense international co-authorship, Poland fares relatively well (12.3 percent of academics), and better than the United Kingdom, Germany, Ita-

Table 7. **Various international activities, academics employed full-time in universities, by country** (some answers from 1 to 5 on a five-point Likert scale, answers 1 and 2, "strongly agree" and "agree", "very much" and "much" combined), in percent.

The percentage of academic...	PL	DE	AT	FI	IE	IT	NL	NO	PT	CH	UK	Mean
who emphasize international perspectives or content in their courses	58,0	57,0	74,6	51,4	84,5	61,1	62,7	64,1	81,5	—	61,8	65,7
whose most graduate students are currently international	2,0	4,4	9,0	8,8	20,5	1,9	33,1	9,4	1,8	20,1	36,7	13,4
who employ in teaching primarily English	6,0	5,1	11,6	18,5	—	4,0	46,8	9,2	2,6	16,6	98,0	13,4*
teaching any courses abroad	15,8	9,4	23,3	15,0	19,1	13,7	14,9	22,1	7,4	22,2	12,8	16,0
teaching any courses in a foreign language	35,6	24,0	42,2	50,0	6,5	23,9	60,0	61,5	18,0	43,9	3,6	33,6
whose primary research is international in scope or orientation	45,8	53,7	65,7	62,5	72,0	75,1	81,7	66,6	57,4	64,8	64,1	64,5
collaborating with international colleagues in research	51,1	50,8	78,7	73,0	79,7	59,6	80,8	61,4	52,2	75,4	69,1	66,5
who employ in research primarily English	37,1	51,7	64,9	69,9	—	64,9	75,2	55,6	63,5	75,5	96,7	62,0*
publishing in a foreign country (>25%)	58,7	57,2	71,7	64,9	66,6	55,4	—	67,6	68,3	64,4	38,2	61,3
publishing in a foreign country (>50%)	38,9	42,1	59,9	53,8	53,2	46,3	—	57,6	51,9	55,2	20,2	47,9
publishing in a foreign language (>25%)	71,8	75,3	72,7	69,9	2,9	67,3	90,2	85,3	65,9	68,6	2,9	61,2
publishing in a foreign language (>50%)	50,7	59,9	61,1	59,3	1,4	58,4	82,5	74,5	48,1	57,1	2,0	50,5
publishing works co-authored with colleagues located in other countries (>25%)	24,1	24,0	35,6	26,3	28,8	21,3	41,7	29,6	25,7	38,6	22,3	28,9
publishing works co-authored with colleagues located in other countries (>50%)	12,3	9,1	16,4	12,4	12,4	9,9	21,2	13,0	8,8	19,4	7,7	13,0
whose research external funding comes from international organizations	24,1	9,8	19,9	11,6	15,4	12,4	20,8	8,5	21,2	10,2	16,7	15,5
who spent in other countries since the award of their first degree at least two years	20,6	14,9	28,3	20,0	48,2	24,6	29,7	27,7	17,9	39,9	30,2	27,5

"—"—missing data; "mean" is the average of the country means;

* the Irish and UK data (where available) not used for calculating the mean.

3. Internationalization: "Hard" and "soft" clusters of academic fields

Research into the internationalization of the academic profession shows significant cross-national differences, but also significant cross-disciplinary differences. Not surprisingly, academics live in "small worlds, different worlds," as Burton Clark argued:

> academics are possessed by disciplines, fields of study, even as they are located in institutions. With the growth of specialization in the last century, the discipline has become everywhere an imposing, if not dominating, force in the working lives of the vast majority of academics. Organized around individual subjects, the disciplines have their own histories and trajectories, their own habits and practices [Clark, 1987. P. 25].

Clark's matrix [1983. P. 28ff.] emphasizes that the academic work is embedded, on the one hand, in institutional and, on the other, in disciplinary settings: "Higher education must be centered in disciplines, but it must simultaneously pulled together in enterprises;" that is, individual institutions. 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 tribes [Becher, Trowler, 2001]. While we do not analyze here "other higher education institutions" and restrict our sample only to clearly, nationally-defined "universities" (and full-time faculty), our preliminary statistical analysis shows that universities are considerably more internationalized that other types of institutions across Europe, a finding that is consistent with previous research.

Our focus is therefore only on the cross-disciplinary differentiation, leaving the cross-institutional differentiation for further research. In our cross-disciplinary analysis, all academic fields used in the survey instrument were grouped into two broad clusters: "soft" and "hard" fields (following [Rostan, 2012]). Soft fields include "teacher training and education science," "humanities and arts," "social and behavioral sciences," "business and administration, economics", and "law"; hard fields include "life sciences," "physical sciences, mathematics, computer sciences," "engineering, manufacturing and construction, architecture," "agriculture," "medical sciences, health related sciences, social services", and "personal services, transport services, security services" (all cases indicating "other" as a current academic unit were removed from the analysis).

Cross-disciplinary and cross-national differences in various aspects of internationalization are striking. We shall discuss them brief-

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ly, and Portugal. Polish academics are also well-internationalized in terms of their international experiences abroad: slightly more than one-fifth of all Polish academics have spent at least two years abroad since their graduation, more than academics in Germany, Portugal and equal to Finland. On recent reforms, see [Kwiek, 2014b, Kwiek 2013b].

ly using 11 variables, three of them in two versions: for both the 25 and 50 percent thresholds. Consistent with research literature on disciplinary differences in academic collaboration in general [Lewis et al., 2012; Lee, Bozeman, 2005; Shin, Cummings, 2010] and in international academic collaboration in particular [Abramo et al., 2011, Smeby, Trondal, 2005], European academics in soft fields are much less internationalized.

From among 14 parameters studied (see Table 8 below), in only three parameters are academics from soft fields more internationalized than those from hard fields, two of which refer to academic attitudes: in teaching, a higher share of academics emphasizes international perspectives or contents, and in research, a higher share of academics emphasizes international scope or orientation in their primary research. They also teach courses abroad more often. A slightly higher share of academics in hard fields teaches primarily in English (14.2 versus12.1 percent) and a much higher share is conducting research primarily in English (about three-quarters, compared with less than one-half in soft fields). A higher share of academics in hard fields collaborates internationally in research. Substantial cross-disciplinary differences are in publishing: in both more and less intense forms of internationalization, European academics in hard fields are substantially more internationalized. While seven in ten academics in hard fields are publishing at least 25 percent of their works in a foreign country, a minority are doing so in soft fields; for the 50 percent threshold, the difference is more acute: six in ten versus three in ten. Similarly, while about three-quarters of academics in hard fields are publishing at least 50 percent of their works in a foreign language, only slightly more than one-third of academics in soft fields are doing so. As could be expected, academics in hard fields co-author publications with international colleagues much more often (at the 50 percent threshold, 17.7 percent versus 5.3 percent) in the reference period of three years.

From a cross-national perspective, the cross-disciplinary patterns in research and publishing are almost universal; the only differences are in Ireland (academics in soft fields collaborate internationally in research at higher levels) and in Portugal and Switzerland where the difference between the fields in marginal (about 1 p. p.). Additionally, in Ireland and in the UK, academics in soft fields publish more often in a foreign language (i. e., in a language other than English) and academics in soft fields in Ireland internationally co-author their works more often. Otherwise, the pattern of cross-disciplinary differences holds firmly across the Continent. European patterns as shown in our cross-national research are consistent with results from previous research, which focused primarily on single nations ([Shin, Cummings, 2010] for South Korea, [Cummings, Finkelstein, 2012] for the USA, [Lewis, 2013] for Australia, New Zealand and the UK, and [Abramo et al., 2009] for Italy).

Table 8. **International teaching, research, and research dissemination activities, by broad clusters of academic fields: soft (S) and hard (H), academics employed full-time in universities, in percent.**

The percentage of academics...	PL		DE		AT		FI		IE		IT		NL		NO		PT		CH		UK		Mean	
	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
Teaching																								
who emphasize international perspectives or content in their courses	63,5	53,3	73,8	51,8	78,9	71,5	62,9	42,1	86,3	84,4	67,1	58,3	68,2	58,7	72,9	52,8	89,9	74,0	—	—	81,6	51,0	74,5	59,8
most of whose graduate students are currently international	1,7	2,3	5,1	4,6	9,9	6,8	6,1	10,8	22,8	18,5	1,2	2,1	22,4	42,2	8,9	8,4	1,6	1,7	17,4	22,1	42,8	33,6	12,7	13,9
teaching primarily in English	9,1	3,4	7,2	4,8	9,3	13,6	13,1	22,4	—	—	5,1	3,4	41,3	50,8	6,4	10,6	3,2	0,8	14,2	18,4	94,3	100,0	12,1*	14,2*
teaching any courses abroad	21,8	10,5	12,1	8,6	30,9	16,5	20,1	11,0	19,9	19,3	18,8	11,4	19,0	11,9	26,5	19,6	4,3	8,3	22,8	22,0	10,1	14,5	18,8	14,0
teaching in a foreign language	42,7	29,3	27,3	24,1	37,9	45,6	46,0	51,8	6,3	7,3	30,8	20,8	62,3	59,3	54,1	68,0	16,7	17,8	35,2	49,6	5,8	2,4	33,2	34,2
Research																								
whose primary research is int'l in scope or orientation	52,8	39,9	55,1	53,4	75,1	57,5	63,4	63,5	75,6	67,5	70,2	77,2	77,0	85,6	72,2	63,3	53,1	62,3	65,0	65,7	74,1	60,1	66,7	63,3
collaborating int'l in research	45,5	55,7	44,4	53,5	76,5	80,2	67,6	77,4	83,1	75,9	51,1	63,4	74,1	86,5	53,6	66,4	51,2	50,6	75,6	74,2	53,8	75,4	61,5	69,0
research—primarily in English	19,1	53,6	28,3	60,5	40,8	83,0	54,1	81,1	—	—	33,6	78,0	76,8	74,1	40,4	70,1	48,8	78,3	55,4	86,6	88,9	100,0	44,1*	73,9*
Research dissemination: publishing...																								
in a foreign country (>25%)	45,7	71,6	21,9	69,4	59,7	81,5	47,4	75,1	65,2	67,4	24,2	69,5	—	—	53,1	76,9	50,3	80,6	55,5	69,6	30,4	41,6	45,3	70,3
in a foreign country (>50%)	24,2	53,1	11,1	52,4	41,1	74,2	31,2	66,7	54,3	51,7	11,8	61,8	—	—	34,9	71,6	30,4	68,8	41,4	63,1	13,1	23,3	29,4	58,7
in a foreign language (>25%)	57,6	86,1	32,3	89,3	49,6	90,6	57,8	77,2	3,5	3,0	31,1	83,6	82,8	95,7	71,4	93,9	49,2	73,5	56,9	74,4	8,6	0,4	54,3*	84,9*
in a foreign language (>50%)	34,2	67,7	15,9	74,4	30,7	84,1	39,8	69,4	2,0	1,1	19,2	76,1	70,5	91,8	54,4	86,5	31,0	60,0	40,4	65,8	6,7	—	37,3*	75,1*
int'l co-authored (>25%)	11,2	36,3	7,9	28,6	16,9	49,3	14,0	33,5	30,5	26,6	6,9	27,7	30,3	50,5	14,4	39,1	9,6	31,0	20,8	48,7	6,9	29,0	15,4	36,4
int'l co-authored (>50%)	5,6	19,0	0,9	12,0	3,7	26,4	5,0	17,1	—	11,6	3,0	12,9	12,2	28,2	6,0	17,7	3,4	13,5	7,7	25,8	—	11,0	5,3	17,7

"-"—missing data; "mean" is the average of the country means; *Irish and UK data (where available) not used for calculating the mean.

4. Internationalization, research productivity and publication co-authorship across academic fields: "internationalists" and "locals"

Finally, we discuss in more detail the role of internationalization in research productivity. The relationship between international cooperation and research productivity has been widely discussed in research literature, with a general assumption that collaborative activities in research increase research productivity [Teodorescu, 2000; Godin, Gingras, 2000; Lee, Bozeman, 2005; He et al., 2009; Shin, Cummings, 2010; Abramo et al., 2011]. But as Sooho Lee and Barry Bozeman [2005. P. 673] pointed out, "Despite the ubiquitous nature of collaboration in science, the benefits of collaboration are more often assumed than investigated. ... Do those who collaborate more tend to have more publications?" Yes, indeed, they do tend to, and very much so, as we shall conclusively show below.

We shall analyze two specific aspects of internationalization in research: first, the correlation between international academic cooperation in research and academic productivity (following Daniel Teodorescu's [2000. P. 206] definition of research productivity as a "self-reported number of journal articles and chapters in academic books that the respondent had published in the three years prior to the survey") and, second, the correlation between international academic cooperation in research and co-authorship of publications with international colleagues (at the aggregated European level, across five major clusters of academic fields (globally, see [Rostan et al., 2014])[3].

Academic disciplines (along with academic institutions) determine both the patterns of academic attitudes and the patterns of academic behaviors—in our case, international orientation in research and international publishing. The notions of Burton Clark's "small worlds, different worlds" and Tony Becher and Paul R. Trowler's "academic tribes and territories" are as important to cross-disciplinary patterns of international cooperation as Karin Knorr Cetina's "epistemic cultures" and Mary Henkel's "academic identities". They all show, through different concepts and based on different empirical material, that cooperation patterns (and certainly, by inference, international cooperation patterns) are discipline-sensitive.

In some disciplines, the imagery of "lonely scholars" rules, while in others, collaboration is key for both academic success and academic recognition [Lewis et al., 2012; Wanner et al., 1981]. The intensity of national and international collaboration is not uniform across different academic fields [Abramo et al., 2009]. As Jenny M. Lewis [2013.

[3] The clusters of academic fields studied here are the following: "life sciences and medical sciences" (termed "life sciences" and "medical sciences, health-related sciences, social services" in the survey instrument), "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").

P. 103] recently showed on a sample of academics interviewed in Australia, New Zealand, and the UK, research in 2008 in these countries was done "alone" by about two-thirds of academics in the humanities and only by one in fourteen academics in science (65.6 percent versus 7.4 percent); it was done "with others" by only one in seven in the humanities and by three-fourths in sciences (13.5 percent versus 75.3 percent).

4.1. The international academic cooperation in research and academic productivity

Thus, the first question is how strongly international collaboration in research is correlated with higher-than-average research productivity and whether the relationships found hold across all academic disciplines. Responses to the question, "How many of the following scholarly contributions have you completed in the past three years?" with the number of "articles published in an academic book or journal" were analyzed (see differences in national research productivity according to different items and the average productivity indexes across Europe in Table 14 in Appendices). The analysis was conducted with reference to two separate groups of academics, termed "internationalists" and "locals" in this paper.

We define "internationalists" as academics indicating their involvement in international research collaboration and "locals" as academics indicating their lack of involvement in such collaboration. The independent samples t-test was used—it is a parametric statistical test used for testing a null hypothesis of equality of the means in two independent subpopulations (if a hypothesis concerns more than two subpopulations, one-way ANOVA is used).

Across all clusters of academic fields, the difference in productivity rates between European "internationalists" and European "locals" is statistically significant at a high level ($P < 0.001$, see Table 10 below). European academics who were collaborating with international colleagues in research had published, on average, substantially more articles in academic books or journals than their colleagues in the same academic field who were ***not*** recently collaborating internationally.

As shown below in Table 9, the percentage of academics collaborating internationally in research across Europe is high, and two-thirds of academics (on average) reported such activity. However, there are huge cross-disciplinary and cross-national differences. The share of "internationalists" varies significantly across major clusters of academic fields. Consistent with previous studies, academics in the cluster of physical sciences and mathematics are by far the most internationalized in research (three-quarters of them are collaborating internationally) and academics in the cluster of professions are the least internationalized (only about half of them are collaborating internationally). In light of previous studies, it is surprising that the level of internationalization as measured by the proxy of international collaboration in research is similar for the humanities and social sciences on the one hand and engineering on the other hand (about 63–65 percent of ac-

ademics are collaborating internationally). The "European field mean" column below shows the mean percentage for all European academics studied in a given cluster of academic fields (regardless of the country), while the "Field mean" column shows the mean of the countries' means (that is, takes into account differences in national populations per cluster of fields).

Huge cross-national differences apply, as seen in the same Table 9 below. There are clearly four categories of countries: internationalization "leaders", "followers", "moderates", and "laggards". The most highly internationalized systems in Europe, or internationalization leaders, are the relatively small systems of Ireland and the Netherlands (on average, more than four in every five academics are collaborating internationally), followed by Austria, Switzerland and Finland, internationalization followers (with about three-fourths of academics collaborating internationally). The two least internationalized systems, or internationalization laggards, are the relatively big systems of Poland and Germany, with slightly less than a half (about 48 percent) of all academics collaborating internationally. The remaining countries are internationalization moderates. Surprisingly, the patterns of internationalization of Polish and German systems are almost identical in all five clusters of academic fields: the highest for physical sciences and mathematics (over 70 percent) and life sciences and medical sciences (in the 50–60 percent range), the lowest for professions (in the 30–40 percent range) and for engineering (slightly below 30 percent). Both systems are among the biggest in Europe, with powerful hierarchical differences and strictly defined career ladders, and both are still rooted in Humboldtian ideals of the university (see the role of modern universities in providing national consciousness and national social glue [Kwiek, 2010; Kwiek, 2013a).

"Internationalists" (lines "Yes" in Table 10 below) across all academic fields had published on average about twice as many articles as "locals" (lines "No" in Table 10), with a large differentiation between academic fields. (Similarly, the "volume" of international collaboration, which we are unable to measure here based on the survey instrument used, is reported on the basis of a bibliometric analysis to be "positively correlated to productivity" [Abramo et al., 2011. P. 642]). In some academic fields, "internationalists" produced on average about 140 percent (engineering) and about 120 percent (physical sciences, mathematics) more articles, while in others (humanities and social sciences, and professions), they produced about 70 percent more articles in the reference period. "Internationalists" in life sciences and medical sciences, the academic field with the highest productivity rate, produced on average 8.80 articles (79 percent more than "locals," who produced on average 4.91 articles). The 95% confidence interval for mean (e. g., 8.26 articles as a lower bound and 9.34 articles as an upper bound in the case of life sciences and medical sciences) indicate that the 8.26–9.34 interval covers the number of articles with 95

Table 9. **Percentage of academics collaborating internationally in research, by academic field and country, only research-involved academics** (in percent).

	European field mean	DE	AT	FI	IE	IT	NL	NO	PT	CH	UK	PL	Field mean
Life sciences and medical sciences	64.8	58.7	84.4	77.4	80.7	58.6	79.3	66.7	55.6	71.7	83.3	54.8	70.1
Physical sciences, mathematics	74.7	72.0	88.3	84.7	80.0	71.4	91.7	68.5	54.2	83.3	71.4	72.4	76.2
Engineering	60.0	26.9	76.1	75.0	74.0	58.2	86.4	66.1	68.3	75.4	61.6	26.8	63.2
Humanities and social sciences	62.5	51.8	82.2	73.4	83.6	56.9	80.4	59.3	64.9	-	61.0	47.5	66.1
Professions	52.6	34.6	56.1	63.6	84.6	42.0	67.5	42.7	54.6	77.8	25.0	38.3	53.3
Country mean	63.0	48.8	77.4	74.8	80.6	57.4	81.1	60.7	59.6	77.1	60.5	48.0	66.0

"—"—missing data.

percent of certainty; similarly, "internationalists" in the humanities and social sciences, the academic field with the lowest productivity rate, produced on average 6.61 articles (70 percent more than "locals," who produced on average 3.89 articles). The academic field with the highest productivity rate differential between "internationalists" and "locals" in Europe is clearly engineering, with average productivity rates of 6.97 articles for the former group and 2.91 articles for the latter group.

As Table 11 below clearly demonstrates, in all countries and in all clusters of academic fields studied, international collaboration in research leads to substantially more publications. Only for the Netherlands, the most highly internationalized system in Europe, are the results not statistically significant. If we assume that the mean number of publication of "locals" is 100 percent, then the mean field for "internationals" varies from about 240 to more than 400, and the country mean for "internationals" varies from 166 in Italy to 716 in Austria (based on two clusters only). The average of country means is more than 300.International collaboration pays off most in terms of knowledge production in engineering (on average, academics collaborating internationally produce four times more publications) and least for humanities and social sciences and professions (about two and a half times more). Results were statistically significant for only seven countries in the cluster of engineering, six countries in physical sciences and mathematics, and merely three in professions.

4.2. International academic cooperation in research and co-authorship of publications with international colleagues

There seems to be a fundamental difference between internationalization as research *collaboration* and internationalization as *international*

Table 10. **Articles published by European academics in an academic book or journal by international collaboration in research** ("internationals"—Yes, and "locals"—No) **and academic fields.**

Academic field	International collaboration	N	Mean no. of articles	SE	95% confidence interval for mean		t-test for Equality of Means	df	p-value
					LB	UB			
Life sciences and medical sciences	Yes	1542	8.80	0.28	8.26	9.34	11.27	2293.69	<0.001
	No	837	4.91	0.21	4.50	5.32			
Physical sciences. mathematics	Yes	887	8.13	0.34	7.46	8.80	10.17	1069.66	<0.001
	No	301	3.74	0.26	3.22	4.25			
Engineering	Yes	502	6.97	0.54	5.92	8.03	6.76	696.67	<0.001
	No	335	2.91	0.27	2.38	3.44			
Humanities and social sciences	Yes	1249	6.61	0.27	6.09	7.13	8.24	1936.99	<0.001
	No	749	3.89	0.20	3.50	4.27			
Professions	Yes	503	6.85	0.35	6.15	7.54	6.04	901.80	<0.001
	No	455	4.12	0.28	3.35	4.60			

Table 11. **Percentage of articles published by academics collaborating internationally in research in an academic book or journal international** (no international collaboration in research = 100 percent)**, by academic field** (in percent).

	European Field Mean	DE	AT	FI	IE	IT	NL	NO	PT	CH	UK	PL	Field Mean*
Life sciences and medical sciences	178	253	334	270	232	144	—	272	—	274	—	149	241
Physical sciences, mathematics	217	357	—	370	—	168	—	369	—	—	278	317	310
Engineering	240	326	1098	268	—	140	—	297	323	—	—	432	412
Humanities and social sciences	170	114	—	249	382	186	—	196	320	357	184	157	238
Professions	166	—	—	234	294	188	—	—	—		—	—	239
Country mean	194	263	716	278	303	166	—	284	322	316	231	264	314

"-"—results not statistically significant, p-value>0.05, "- -"—missing data, *—countries only.

co-authorship of research publications. The former is more informal, the latter is more formal [Rostan et al., 2014. P. 136]. Presumably, only a fraction of international collaboration activities leads to internationally co-authored publications. Academics can collaborate internationally and still *not* be involved in cross-border knowledge transfer—that is, joint academic publishing. Before we discuss European academics, a comment has to be made. International publication co-authorship occurs at a more individual level than international collaboration, and at the individual level, some preconditions have been identified in research literature. As Jens-Christian Smeby and □se Gornitzka [2008. P. 43] argue in their study of the changing internationalization of Norwegian academics across two decades, the integration of researchers into transnational academic communities is dependent on two separate factors: motivation on the part of the researcher and his/her attractiveness as a researcher to international colleagues. Both factors are closely linked: "The researcher needs to have the motivation in order to make the effort to engaging internationally. Attractiveness refers to the extent to which international colleagues perceive a researcher as a relevant and interesting partner." Another relevant factor is the availability of resources:

> At the individual level, one precondition for coming into contact with other researchers is the motivation to seek such contacts. Moreover, the scientist has to be attractive to other researchers. Another precondition that should be added is resources. Resources are needed to conduct research and to undertake travel. Material conditions like access to good research equipment may also constitute a basis of researchers' attractiveness [Smeby, Gornitzka, 2008. P. 38].

The second aspect of internationalization studied here is the difference in the *proportion* of internationally co-authored publications between the subsample of "internationalists" and the subsample of "locals" in Europe. In our analysis, the difference is statistically significant at a high level (p-value$<$ 0.001) across all clusters of academic fields. While research productivity was analyzed above in correlation with international collaboration across different academic fields, here the intensity of international publication co-authorship is analyzed in correlation with international collaboration across academic fields.

At the aggregated European level, the differences between "internationalists" and "locals" are consistent across all clusters of academic fields. And they can be summed up in a single statement: "No international collaboration, no international co-authorship". The average proportion of internationally co-authored publications for "internationalists" differs across academic fields (see Table 12 below): consistent with previous research results which link international research col-

Table12. **Percentage of articles by European academics published in an academic book or journal coauthored with colleagues located in other (foreign) countries, by international collaboration in research and academic field** (in percent).

Academic field	International collaboration	N	Mean percentage of articles	SE	95% confidence interval for mean		t-test for Equality of Means	df	p-value
					LB	UB			
Life sciences and medical sciences	Yes	1373	34.67	0.89	32.92	36.42	24.24	2029.05	<0.001
	No	699	6.69	0.73	5.25	8.13			
Physical sciences. mathematics	Yes	818	41.00	1.23	38.60	43.40	20.48	833.11	<0.001
	No	266	6.16	1.18	3.85	8.47			
Engineering	Yes	479	25.02	1.34	22.40	27.64	10.29	743.83	<0.001
	No	283	6.57	1.19	4.23	8.91			
Humanities and social sciences	Yes	1109	14.20	0.70	12.83	15.57	13.86	1698.49	<0.001
	No	594	2.39	0.49	1.43	3.35			
Professions	Yes	461	19.14	1.25	16.70	21.58	12.00	654.00	<0.001
	No	374	2.54	0.60	1.36	3.72			

laboration with higher research productivity across disciplines [Shin, Cummings, 2010], it is the highest for physical sciences and mathematics (41 percent) and the lowest for humanities and social sciences (only 14 percent) and professions (19 percent). There is a powerful relationship between being involved in international cooperation in research and international co-authorship of articles in books and journals. The difference in the share of the latter type of publications between "internationalists" and "locals" is huge: the average rate of international co-authorship for "internationalists" is between 4–5 times higher (in engineering and in life sciences and medical sciences) and 7.5 times higher (in professions). Academics *not* collaborating internationally report no more than merely 7 percent of their publications being internationally co-authored in the three "hard" fields and no more than merely 3 percent in the two "soft" fields only. The highest difference in the share between academics collaborating and not collaborating internationally is in the second least internationalized academic field (professions) and the lowest difference is in the second most internationalized academic field (life sciences and medical sciences). In the most internationalized academic field (physical sciences and mathematics), the share of internationally co-authored publications for "internationalists" is 41 percent while the share for "locals" is only 6.16 percent. The pattern is consistently similar for both academics collaborating internationally and those not collaborating international-

ly across all academic fields studied. Those not collaborating internationally co-author only a marginal percentage of their publications with colleagues from other countries. Their share in the academic profession in Europe is substantial, however: about four out of ten academics in professions and engineering, about three out of ten in humanities, social sciences, life sciences, and medical sciences, and about a quarter of all academics in physical sciences and mathematics do not collaborate internationally.There are strong patterns across Europe, with some variations, though, as can be seen from the detailed national data in Table 14 in the Data Appendix.

5. Conclusions

Our study shows that research productivity of European academics is strongly correlated with international research collaboration: the average research productivity rate of European academics involved in international collaboration (whom we term "internationalists") is consistently higher than the rate of European academics *not* involved in international collaboration (whom we term "locals") in all academic fields in all countries studied.

International publication co-authorship is also powerfully correlated with international research collaboration: the average rate of international co-authorship for "internationalists" is between about 4–5 times higher (in the clusters of engineering, life sciences, and medical sciences) and 7.5 times higher (in the cluster of professions) than this rate for "locals." Academics *not* collaborating internationally report merely 7 percent of their publications being internationally co-authored in the "hard" fields and no more than 3 percent in the "soft" fields studied. Thus, in the specific case of publishing in co-authorship with international colleagues, the policy lesson is simple: "No international collaboration, no international co-authorship."

These results lead to strong policy implications. Large-scale international publication co-authorships are, on average, only possible if produced by "internationals" on the basis of their international collaboration. Only a negligible fraction of publications from nationally isolated science (produced by "locals") can be internationally co-authored, and internationally co-authored publications are strictly related to collaborative activities with international colleagues. And if cross-border activities are to involve more than "a small attractive elite" [Smeby, Gornitzka, 2008. P. 39], incentives combined with resources are a necessary precondition. Consequently, what Sooho Lee and Barry Bozeman [2005. P. 693] termed "the collaboration-as-synergy assumption" held by policy-makers (strongly believing that scientific collaboration has positive effects on research productivity) affects not only "particular research awards" but also "entire programs of research policy". Consequently, any national system focused on increasing the international visibility of its knowledge production needs

to place the internationalization of research at the center of its national research policy.

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Data Appendix:

Table 13. **Average research productivity, all items**
Question D4 "How many of the following scholarly contributions have you completed in the past three years?" (academics involved in research only).

Countries / Items	Scholarly books authored or co-authored	Scholarly books edited or co-edited	Articles in an academic book or journal	Research report/monograph written for a funded project	Paper presented at a scholarly conference	Professional article written for a newspaper or magazine	Patent secured on a process/invention	Computer program written for public use	Artistic work performed or exhibited	Video or film produced	Others	A composite country index of research productivity
Austria	0.6	0.7	3.5	1.9	8.2	1.2	0.3	0.3	0.3	0.2	0.3	23.7
Finland	0.4	0.3	4.6	1.3	4.3	1.1	0.1	0.1	0.3	0.1	0.3	16.8
Germany	0.3	0.3	6.2	1.7	5.4	1.3	0.2	0.1	0.5	0.3	0.3	19.4
Ireland	0.3	0.3	5.9	1.5	6.7	1.1	0.1	0.2	0.4	0.2	0.3	19.0
Italy	1.0	0.5	9.1	1.6	7.7	1.9	0.1	0.1	0.1	0.1	0.2	31.0
Netherlands	0.4	0.3	5.9	1.1	4.2	1.8	0.1	0.2	0.2	0.0	0.1	17.6
Norway	0.4	0.2	4.8	0.6	4.3	1.4	0.1	0.2	0.5	0.2	0.6	14.7
Poland	0.2	0.1	3.7	0.3	3.0	0.8	0.1	0.0	0.1	0.0	0.2	8.9
Portugal	0.5	0.5	4.2	1.3	6.4	1.1	0.1	0.1	0.5	0.1	0.4	19.5
Switzerland	0.4	0.2	5.0	1.7	4.6	1.2	0.1	0.2	0.3	0.2	0.2	18.2
UK	0.3	0.2	5.4	1.2	4.9	0.7	0.1	0.2	0.2	0.1	0.4	16.0

Note: the composite country index of research productivity weights particular outputs and aggregates the scores; from among several options of constructing an index e.g. [Ramsden, 1994. P. 212–213; Teichler, Arimoto, Cummings, 2013. P. 146–147; Arimoto, 2011. P. 296], we have selected the latter—we have attributed 10 points for each book, 5 points for an edited book, 1 point for each book chapter or article, 3 points for each research report, 0.5 point for a paper presented, computer program written, artistic work or film produced, 0.3 point for each newspaper article; "others" are not included in the total average productivity.

Table 14. **Summary: mean** *percentage* **of articles by academics published in an academic book or journal coauthored with colleagues located in other (foreign) countries, by international collaboration and academic field** (in percent). Based on separate analyses of 11 countries in the format presented for all European academics in Table 12.

International collaboration	European	PL	DE	AT	FI	IE	IT	NL	NO	PT	CH	UK	Field mean*
Yes	34.67	42.77	30.83	43.12	39.06	24.61	29.05	—	38.61	27.99	35.52	20.94	36.72
No	6.69	3.43	8.57	7.70	10.99	2.47	2.87	—	7.12	9.91	24.69	5.53	9.00
Yes	41.00	44.42	35.66	50.99	37.11	—	40.72	47.89	40.14	—	63.47	37.97	43.94
No	6.16	11.38	4.38	12.86	1.02	—	4.61	5.29	1.39	—	31.43	7.07	8.83
Yes	25.02	66.07	24.15	35.16	15.51	28.63	17.46	—	28.20	—	— —	30.07	30.66
No	6.57	3.12	5.62	13.33	7.06	4.05	3.49	—	4.42	—	— —	0.00	5.14
Yes	14.20	13.55	—	13.28	14.04	24.38	11.04	—	14.82	13.32	—	8.43	14.11
No	2.39	1.43	—	1.32	0.00	5.18	2.18	—	3.37	2.66	—	2.22	2.30
Yes	19.14	21.58	15.32	25.90	—	26.81	5.93	31.51	28.59	—	—	—	22.23
No	2.54	3.16	2.52	1.32	—	3.01	1.41	4.87	1.96	—	—	—	2.61
Yes		37.68	26.49	33.69	26.43	26.11	20.84	39.70	30.07	20.66	49.50	24.35	29.53
No		4.50	5.27	7.31	6.53	3.68	2.91	5.08	3.65	6.29	28.06	3.70	5.58

"—"—results not statistically significant, p-value>0.05, "——"—missing data. "European" = mean for all European academics in a given field; "field mean" = the mean of country means in a given field.