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The Internationalization of the Polish Academic Profession

A comparative European approach

Abstract: The internationalization of the Polish academic profession is studied quantitatively in a comparative European context. A micro-level (individual) approach relying on primary data collected in a consistent, internationally comparable format is used (N = 17211 cases). The individual academic is the unit of analysis, rather than a national higher education system or an individual institution. Our study shows that research productivity of Polish academics (consistent with European patterns) is strongly correlated with international collaboration: the average productivity of Polish academics involved in international collaboration ("internationalists") is consistently higher than that of Polish "locals" in all academic fields. Polish academics are less internationalized in research than the European average but the research productivity of Polish "internationalists" is much higher than that of Polish "locals". The impact of international collaboration on average productivity is much higher in Poland than in the other European countries studied, a finding with important policy implications.

Keywords: Internationalization, International Cooperation, European Academic Profession, Research Productivity, Polish Universities

1. Introduction

The need for intensifying internationalization of Polish higher education was one of the major themes in a recent (2008–2012) wave of reforms. In particular, two aspects were focal points in these policy debates: internationally visible publications as part of "internationalization at home", and international research cooperation as part of "internationalization abroad", corresponding to Jane Knight's (2012, pp. 34–37) two "pillars of internationalization" (see Kwiek, 2013a and 2013b). In this paper, we use a micro-level (individual) approach relying on primary academic attitudinal and behavioral data voluntarily provided by academics in a consistent, internationally comparable format, with only some references to macro-level secondary data (available from national and international statistics). The individual academic is the unit of analysis, rather than national higher education systems or individual institutions. For the first time, a new "data-rich" research environment in international comparative academic profession studies allows a quantitative analysis of the internationalization of Polish academics in a comparative European context.

The data used in this study are drawn from eleven European countries involved in the CAP ("Changing Academic Profession") and EUROAC ("Academic Profession in

	N	Universities %	Other HEIs %	Full-time	Part-time
Austria	1492	100.0	0.0	65.8	34.2
Finland	1374	76.5	23.5	82.4	17.6
Germany	1215	86.1	13.9	70.7	29.3
Ireland	1126	73.3	26.7	91.2	8.8
Italy	1711	100.0	0.0	96.9	3.1
Netherlands	1209	34.4	65.6	56.0	44.0
Norway	986	93.3	6.7	89.7	10.3
Poland	3704	48.3	51.7	98.0	2.0
Portugal	1513	40.0	60.0	90.3	9.7
Switzerland	1414	45.6	54.4	58.5	41.5
UK	1467	40.8	59.2	86.5	13.5

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

Tab. 1: Sample characteristics, by country

Europe: Responses to Societal Challenges”) 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 was 17211, with approximately 1000 to 1700 surveys for each European country studied, except Poland where the number was higher (see Table 1).

Individual data files were produced in all participating countries but specific national categories (faculty ranking, institutional types, etc.) were reduced to internationally comparable categories. An international codebook was created and a number of coding modifications were introduced in national data files, in particular the dichotomization into “senior” and “junior” faculty and into faculty employed in “universities” and in “other higher educational 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 were broadly representative of national academic populations for most in-

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

	Life sciences and medical 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	1492
Finland	15.7	9.7	21.5	18.6	12.1	22.4	1374
Germany	29.3	15.2	14.8	15.6	11.1	13.9	1215
Ireland	23.0	11.5	8.8	23.8	20.5	12.4	1126
Italy	28.6	23.3	11.1	17.5	13.6	5.9	1711
Netherlands	12.6	10.9	10.7	22.3	34.7	8.8	1209
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	3704
Portugal	16.9	7.9	20.4	10.5	20.6	23.7	1513
Switzerland	30.8	10.2	12.7	16.9	23.9	5.5	1414
UK	21.9	11.6	6.3	18.6	11.0	30.7	1467

Tab. 2: Proportion of faculty by clusters of academic fields and sample size (N)

dependent variables (national-level sampling techniques: RIHE, 2008, pp. 89–178 and Teichler & Höhle, 2013, pp. 6–9). For our analysis, we used a subsample of 9536 European academics who were employed full-time in universities (as defined by national research teams).

2. Internationalization: A General Overview

Thirteen variables deemed most relevant were selected (three publication-related variables were used at two separate thresholds). From among all internationalization-related activities (or, in some cases, attitudes), there are six which are clearly most common at the aggregated European level (see Table 3). Between one half and two-thirds of all European academics report publishing their work in a foreign language and putting emphasis on international perspectives or content in their courses. And in terms of research, they report collaborating with international colleagues, conducting primary research that is international in scope or orientation, publishing (at least one-fourth of their publications) in foreign countries and utilizing mainly English in their research. Also nearly one half of all European academics published at least fifty percent of their publications in foreign countries in the last three years prior to the survey. Additionally, more than one-fourth of European academics report publishing at least 25 percent of their work as co-authored with colleagues located in other countries and about 12 percent of them report publishing at least 50 percent of their work as co-authored with colleagues located

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.

Tab. 3: 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”), in percent

in other countries. There is, however, a powerful cross-country and cross-disciplinary differentiation in internationalization.

Considering the scarce availability of resources for research and the relatively recent (only within the last two decades) unrestricted opening of Polish universities to global and European academic communities, the Polish academic community presently seems relatively well internationalized (for earlier accounts, see Kwiek, 2001a and 2001b). The initial assumption of this research project was that there is a substantial, structural lagging behind of Polish academics when compared with their ten Western European counterparts included in this study. Surprisingly, as Table 4 shows, Polish academics rank the lowest only in four of the sixteen parameters of internationalization studied. All are research-related and are strongly correlated with the availability of resources. The areas where Poland trails are the following: international research orientation (Poland is the only country in which the majority of academics are *not* internationally oriented

The percentage of academics …	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	21.8
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	65.5
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.

Tab. 4: 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

in research); intense publishing in a foreign country (at least one half (and not simply one-fourth) of one's academic work); publishing in a foreign language; and employing primarily English in research.[2]

In most parameters, Poland scores below the European mean. In teaching, Poland is one of the three countries, together with Finland and Germany, in which less than 60 percent of academics emphasize international perspectives or content. 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 one half of Polish academics report collaborating with international colleagues in research (compared with the European average of about two-thirds).

For 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 work. The variables refer to publishing in a foreign country, publishing in a foreign language, and publishing works co-authored with international colleagues. The results for Poland are far better than expected: low rates of research orientation do not seem to lead to low rates of international research production, although there is strong variation across disciplines, as discussed below.

Polish academics report the lowest share of intense (more than 50 percent of their work) publishing abroad; but in terms of less intense (more than 25 percent of their work) publishing abroad, they do better on average than their German and Italian counterparts. They also do relatively well in less intense publishing in a foreign language (at least 25 percent of their work): on average, they do better than German, Italian, Portuguese, as well as Finnish and Swiss academics. In the case of intense international co-authorship, Poland fares relatively well (12.3 percent of academics), with a higher percentage than the United Kingdom, Germany, Italy, and Portugal. Polish academics are also well internationalized in terms of their experiences abroad: slightly more than one-fifth of all Polish academics spent at least two years abroad after graduation, a higher proportion than that of academics in Germany, Portugal and equivalent to Finland.

Thus in general terms: in their teaching, Polish academics teach courses abroad more often than their German, Finnish, Italian, Dutch, Portuguese and British colleagues and they also teach courses at home in foreign languages more often than their German, Italian, and Portuguese colleagues. In their research, they are less internationally oriented but they fare relatively well in both international publishing and international co-authorship of publications. Poland does not lag behind in the lower concentration of publishing in a foreign language (threshold: 25 percent), in both the lower and the higher concentration of internationally co-authored publications (thresholds: 25 and 50 percent), and in long-term international experience. These are dimensions of internationalization on which Poland can build in the future.

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2 Here and below, the UK and Ireland are sometimes disregarded in statistical analyses due to the predominance of Anglophone journals and books in the channels of international research distribution.

3. Internationalization: "Hard" and "Soft" Clusters of Academic Fields

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", "humanities and the arts", "social and behavioral sciences", "business and administration, economics", and "law". Hard fields include "life sciences", "physical sciences, mathematics, computer science", "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 differences for Poland are striking. We shall discuss them briefly using eleven variables, three of them in two versions, for 25 and 50 percent thresholds. Consistent with research literature on differences across disciplines in academic collaboration in general (Lee & Bozeman, 2005; Shin & Cummings, 2010), and in international academic collaboration in particular (Abramo, d'Angelo & Solazzi, 2011; Smeby & Trondal, 2005), and following a clear pattern for all other European countries, Polish academics in soft fields are much more internationalized in teaching than in research. The proportion of Polish academics teaching courses abroad is twice as high in soft fields compared with hard fields: about two in ten academics in soft fields teach abroad, in contrast to only about one in ten in hard fields. Also three times as many academics in soft fields teach primarily in English. In research, while Polish academics in hard fields collaborate more intensively with international colleagues, as is the case in the vast majority of the countries studied, and use English much more intensively as a language for research, their international research orientation is actually lower than that of academics in soft fields.

In terms of differences in international publishing, the Polish publishing pattern fits European patterns perfectly as shown in our research and is consistent with results from previous research (Shin & Cummings, 2010 for South Korea; Cummings & Finkelstein, 2012 for the US; Lewis, 2013 for Australia, New Zealand and the UK; Abramo, D'Angelo & di Costa, 2009 for Italy). Polish academics from hard fields are consistently more internationalized than their colleagues from soft fields across all three parameters (publishing abroad, publishing in a foreign language, and publishing with international colleagues) and at both lower (25 percent) and higher (50 percent) thresholds. The difference between hard and soft fields is in the 25- to 30-page range in the case of publishing abroad, in the 30-page range in the case of publishing in a foreign language, and in the 15- to 25-page range in the case of international co-authorship. In particular, the proportion of academics with internationally co-authored publication rates of at least 25 percent and at least 50 percent is more than three times higher in hard fields. While approximately 19 percent of Polish academics show a higher rate of international co-authorship, the same parameter for soft fields is only 5.6 percent. The differences are striking but not extremely divergent from other European countries studied. Surprisingly in the context of low rates of international research orientation (a Central Euro-

pean context, see Kwiek, 2012a, 2012b and 2012c), in all three publication-related parameters, Polish academics in hard fields are almost at the European average or above, and in soft fields Polish academics are at about average.

4. Internationalization, Research Productivity, and Publication Co-authorship across Academic Fields: "Internationalists" and "Locals"

The relationship between international cooperation and research productivity has been widely discussed, with the general assumption that collaborative activities in research increase research productivity (Teodorescu, 2000; Lee & Bozeman, 2005; He, Geng & Campbell-Hunt, 2009; Shin & Cummings, 2010; Abramo et al., 2011). But as Sooho Lee and Barry Bozeman (2005, p. 673) point out, "the benefits of collaboration are more often assumed than investigated. (…) Do those who collaborate more tend to have more publications?" Very much so, as we shall show. We analyze two specific aspects of internationalization in research: first, the correlation between international academic cooperation in research and academic productivity (following 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 (…) published in the three years prior to the survey") and, second, the correlation between international academic cooperation in research and the co-authorship of publications with international colleagues, both at the aggregated European level and at a Polish national level, across five major clusters of academic fields (globally, see Rostan, Ceravolo & Metcalfe, 2014).[3]

The first question is thus how strongly international collaboration in research is correlated with higher than average research productivity, and whether the relationship holds across all academic disciplines. Responses to the question "How many of the following scholarly contributions have you completed in the past three years?" were analyzed by utilizing the number of "articles published in an academic book or journal". The analysis was conducted with reference to two separate groups of academics, here termed "internationalists" and "locals". The former included academics indicating their involvement in international research collaboration, and the latter 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).

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 the arts" and "social and behavioral sciences"), and "professions" ("teacher training and educational science", "business and administration, economics", and "law").

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			

Tab. 5: Articles published by European academics in an academic book or journal by international collaboration and academic fields

Across all clusters of academic fields, the difference in productivity rates between European "internationalists" and "locals" is statistically significant (see Table 5). "Internationalists" reported publishing on average substantially more articles in academic books or journals than their colleagues in the same academic field *not* reporting recent international collaboration. "Internationalists" across all academic fields published on average about twice as many articles as "locals," with large differentiation across academic fields. 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 an additional 70 percent of articles.

An analysis of the Polish subsample (Table 6, N = 1441) shows an almost identical cross-disciplinary pattern of research productivity being strongly correlated with international research collaboration. Across four of the five academic field clusters, the difference in productivity rates between Polish "internationalists" and Polish "locals" is statistically significant, although to different degrees. The only academic field that does not statistically follow the pattern to a significant degree is professions. Polish academics were less internationalized in all academic fields but cross-disciplinary differences in internationalization were much higher than in the other countries. Only academics in physical sciences and mathematics collaborated with international colleagues to an almost equal degree (on average about three-fourths of the subsample). In the life sciences and medical sciences, the proportion was about 55 percent and in humanities and the social sciences about 48 percent. The two most internationalized clusters of fields were

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	290	4.56	0.37	3.83	5.28	3.06	524.44	0.002
	No	239	3.07	0.32	2.45	3.69			
Physical sciences, mathematics	Yes	123	3.64	0.49	2.67	4.62	4.33	168.14	< 0.001
	No	47	1.15	0.30	0.56	1.75			
Engineering	Yes	11	8.42	2.85	2.05	14.78	2.19	11.20	0.050
	No	30	1.95	0.76	0.41	3.5			
Humanities and social sciences	Yes	262	5.28	0.38	4.52	6.03	4.07	480.06	< 0.001
	No	290	3.36	0.27	2.83	3.9			
Professions	Yes	57	5.70	0.94	3.82	7.59	1.13	93.37	0.262
	No	92	4.47	0.55	3.39	5.56			

Tab. 6: Articles published by Polish academics in an academic book or journal by international collaboration and academic fields

the same in Europe and in Poland: "physical sciences, mathematics" and "life sciences and medical sciences".

Across all academic fields Polish academics involved in international collaboration published more articles on average than those not involved in international collaboration. In particular, in engineering, that rate was on average greater than four times higher (332 percent), in physical sciences and mathematics three times higher (217 percent), and in life sciences and medical sciences nearly 50 percent higher than that of their internationally non-collaborating colleagues. The difference between average publication rates for "internationalists" and for "locals" was much higher in the case of Polish academics: consequently, it can be inferred that international collaboration has a more powerful impact on productivity in countries which are just entering European and global research communities.

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", both in Europe and in Poland. At an aggregated European level, the differences between "internationalists" and "locals" are consistent across all clusters of academic fields. To put it succinctly: "no international collaboration, no international co-authorship". The average proportion of internationally co-authored publications for "internationalists" differs across academic fields (Table 7): consistent with previous research which links international research collaboration with higher research productivity across disciplines (Shin & Cummings, 2010), rates are highest for the physical sciences and mathematics and lowest for humanities and the so-

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			

Tab. 7: Percentage of articles by European academics published in an academic book or journal coauthored with colleagues located in other (foreign) countries, by international collaboration and academic field (in percent)

cial sciences and professions. 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 between "internationalists" and "locals" is quite dramatic: the average proportion of internationally co-authored publications for "internationalists" is 5 to 7.5 times higher. This pattern is consistently similar for all academics across all academic fields studied. Those not collaborating internationally produced only a marginal percentage of their publications as co-authors with colleagues from other countries.

An analysis of the Polish subsample (Table 8, N = 935) shows an almost identical cross-disciplinary pattern for international publication co-authorship correlated with international collaboration. Across all five clusters of academic fields, the difference in percentages of internationally co-authored publications between "internationalists" and "locals" is statistically significant mostly at a high level (p-value < 0.001). Scholars in all academic fields follow the pattern of a substantial "internationalists"/"locals" differential.

Amazingly, Polish "internationalists" are more internationalized (that is, have a higher proportion of internationally co-authored publications) than European "internationalists" in all academic fields except humanities and the social sciences, where they are slightly below the European average. There are also no substantial differences between Polish and European averages for "locals" except that Polish "locals" in the physical sciences and mathematics have on average twice as high a proportion of internationally co-authored publications as their European colleagues. Thus, the European pattern

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	174	42.77	2.63	37.61	47.93	13.46	247.87	< 0.001
	No	156	3.43	1.27	0.94	5.92			
Physical sciences, mathematics	Yes	72	44.42	4.48	35.64	53.20	4.54	65.54	< 0.001
	No	30	11.38	5.74	0.14	22.62			
Engineering	Yes	7	66.07	16.92	32.91	99.23	3.62	6.51	0.010
	No	18	3.12	4.10	−4.91	11.15			
Humanities and social sciences	Yes	174	13.55	2.24	9.16	17.94	5.16	207.08	< 0.001
	No	199	1.43	0.71	0.04	2.82			
Professions	Yes	39	21.58	5.30	11.18	31.98	3.23	50.91	0.002
	No	66	3.16	2.11	−0.98	7.30			

Tab. 8: Percentage of articles by Polish academics (universities only) published in an academic book or journal coauthored with colleagues located in other (foreign) countries, by international collaboration and academic fields

not only holds in Poland, but it is also even stronger there: while the rates of "internationalists" to "locals" are on average 4 to 7.5 times higher for European academics, these rates are between 4 times as high for Polish academics in the physical sciences and mathematics and 12.5 times as high for Polish academics in the life sciences and medical sciences.

5. Conclusion

Our study clearly shows that the Polish academic community is relatively well internationalized today: there are no substantial differences between Poland and the ten European countries included in the comparison. Poland is the least internationalized system in only a limited number of research-related parameters, and the differences are not dramatic. Polish international publishing patterns fit well with European patterns: Polish academics from hard fields are consistently more internationalized than their colleagues from soft fields across all major publishing parameters. While in terms of research productivity, both Polish "internationalists" and "locals" are less productive than their European colleagues, somehow surprisingly in the context of overall low rates of international research orientation, in terms of internationally co-authored publications, Polish academics in hard fields are above the European average, and in soft fields they are at about average.

Our study also shows that the research productivity of Polish academics (coinciding with European patterns) is strongly correlated with international research collaboration: the average research productivity rate of Polish academics involved in international collaboration ("internationalists") is consistently higher than the rate of Polish "locals" in all academic fields (between 60 and 140 percent). Polish academics are less internationalized in research than the European average but the productivity rate of Polish "internationalists" on average is much higher than the productivity rate of Polish "locals." The impact of international collaboration on average productivity rates across all academic fields is much higher in Poland than in the other European countries studied. International publication co-authorship is also powerfully correlated with international research collaboration: the average international co-authorship rate is between 5 and 7.5 times higher for Polish "internationalists" than for Polish "locals," depending on the academic field. Surprisingly, regarding international co-authorship, Polish "internationalists" are more internationalized than the European average in nearly all academic fields. The European pattern of a higher proportion of internationally co-authored publications for academics collaborating internationally in research compared with those not collaborating internationally holds strongly in Poland: while the rate of "internationalists" to "locals" for European academics is on average between 4 and 7.5 times higher, the same rate for Polish academics, between 7 and 13 times, is considerably higher.

In the context of Polish reforms highlighting the role of international publications, the results of the present study imply a powerful policy conclusion: more international cooperation is the best means for producing more internationally visible national research output. And in the specific case of co-authorship publishing with international colleagues, the policy lesson is even simpler: "no international collaboration, no international co-authorship." Polish academics involved in international collaboration differ much less from their European counterparts in terms of patterns of research productivity than commonly assumed; the problem is the lower research productivity of academics *not* involved in international collaboration and the very high percentage of consistent non-publishers in the university sector (43 percent). Recent reforms (2009–2012, see Kwiek, 2011), however, attempt to address these issues by resorting strongly to new internationalizing mechanisms: through revised institutional research assessment exercises (termed "parametrization") closely linked to institutional funding streams, through revised preconditions of access to individualized competitive research funding, and through changed requirements for academic promotions. In all three areas, the internationalization of research as analyzed above is as important as never before.

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