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Is there a conflict between teaching and research? The views of engineering academics in Europe

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ABSTRACT: This article presents an analysis of data from the international Changing Academic Profession (CAP) and the Academic Profession in Europe: Response to Societal Changes (EUROAC) surveys to compare engineering academics that prefer teaching over research, and *vice versa*. It also highlights the attitudes of each of these groups to teaching and research, the two major academic activities. There has long been debate about whether research and teaching are mutual activities or in competition with each other. According to the survey results, the majority stated a leaning towards research, but this preference was stronger in some countries than in others. In fact, data from the CAP survey reveal that 30% of engineering academics from the 12 participating European countries believe that teaching and research are hardly compatible with each other, but opinions from different countries vary considerably. Even though much higher proportions of academics agree that their research reinforces teaching, even on this measure, there are considerable gaps between countries.

Keywords: Academic staff, engineering teaching and research, CAP survey, EUROAC

INTRODUCTION

Broad opinion suggests that the *raisons d'être* of universities are teaching and research. However, the relative importance of each is sometimes in dispute [1]. As noted by Fox, ...*The notion of combining research and teaching is rooted firmly in academic ideology and institutionalised in academic practices…and indeed, in the daily lives of [academic staff] have been regarded as joint activities* [2].

Fox also describes another view that research and teaching (and, therefore, the preference for each, and the time spent on each) are segmented and competitive: *According to this view, research and teaching are conflicting roles with different expectations and obligations* [2].

Differences between academics that prefer either teaching or research have been studied before, such as Forest's doctoral dissertation that was built on an analysis of academics' responses to an early-1990s questionnaire study by the Carnegie Foundation for the Advancement of Teaching, which was a precursor to the CAP survey [3]. Forest sought to establish whether teaching-oriented academics shared similar characteristics that distinguish them from their research-oriented colleagues, and whether they had different views. He noted that ...*Although teaching is the essence of the academics' work, since it is the nearest thing to a common activity that nearly all professors do, research is what distinguishes professors within their own disciplines and play a substantial role in forming hierarchies within institutions. The Ph.D. - a credential which signifies competence in research - has become the gold standard for entry into the profession…[and] publications have widely become the dominant measure of productivity used for tenure and promotion review committees* [3]. He also found significant international similarities in how teaching-oriented academics responded to the Carnegie survey differently than research-oriented faculty [3].

There is now an opportunity to update findings from the Carnegie study with a more recent international survey, the Changing Academic Profession (CAP) survey. Several questions from the Carnegie survey were also asked in the CAP survey. The CAP survey was initially conducted in 19 countries on five continents during 2007 and 2008. The questionnaire sought academics' opinions on a range of matters to do with governance, management, academic work and perceptions of change. Since the original survey was carried out, academics from six more European countries have come on board due to their involvement in the Academic Profession in Europe: Response to Societal Changes

(EUROAC) project. The questionnaire has been completed by about 25,000 academics world-wide and about 16,500 in the European participating countries [4-5].

This article considers academics in the field of *engineering, manufacturing and construction*, one of 11 disciplinary groupings built into the CAP survey. Some countries have binary systems of education, typically comprising universities and polytechnics or equivalent institutions. In this article, only the opinions of university academics have been included, in order to maximise the comparability of responses across national borders.

Academics expressed a range of propensities to prefer research over teaching and devote differing numbers of hours of the various activities that make up an academic job. Of course, the preference for teaching over research (and *vice-versa*) can change as a career progresses, and other variables might influence the number of hours that academics spend on the different components of their jobs. In this article, the Changing Academic Profession (CAP) survey has been used to provide information about the career proclivities of engineering academics in Europe. The focus here is on teaching and/or research as academics' primary interest, and this analysis is based on respondents' answers to two questions about their preference for teaching or research.

ENGINEERING ACADEMICS: DO THEY PREFER TEACHING OR UNDERTAKING RESEARCH?

Within European universities, 14,551 academics identified their discipline responded, of which 2,282 (15.7%) stated their discipline/field as engineering, manufacturing, construction and architecture, hereafter described as *engineering*. Table 1 provides a summary of the respondents that indicated their preference for teaching and/or research, and it shows that European university engineering academics indicated a slightly higher leaning towards teaching than did academics in other disciplines. Among engineers, 29.1% (3.7% + 25.4%) indicated a preference for teaching, compared with 25.8% of academic respondents in other disciplines (4.7% + 21.1%). Reciprocal proportions indicated a preference for research.

A smaller percentage of engineering academics indicated that they were *primarily interested in research* (17.8% c.f. 21.6%), but a smaller proportion indicated they were *primarily interested in teaching* (3.7% c.f. 4.7%). European engineers, therefore, could be perceived as being more likely to undertake both teaching and research, because the 78.4% (25.4% + 53.0%) indicated a leaning towards both, compared with 73.7% of university academics in other disciplines (21.1% + 52.6%).

Table 1: University academics in engineering by preference for teaching or research - all participating European countries.

	Primarily Teaching	Both - Leaning towards Teaching	Both - Leaning towards Research	Primarily Research	Total
Engineering - No.	76	517	1079	362	2034
Engineering - %	3.7%	25.4%	53.0%	17.8%	100.0%
Other Disciplines - No.	513	2305	5757	2366	10941
Other Disciplines - %	4.7%	21.1%	52.6%	21.6%	100.0%
Total - No.	589	2822	6836	2728	12975
Total - %	4.5%	21.7%	52.7%	21.0%	100.0%
Engineering % of Total	12.9%	18.3%	15.8%	13.3%	15.7%

Source: CAP Survey Question B2 - Regarding your own preferences, do your interests lie primarily in teaching or in research?

The figures in Table 1 are for respondents from all participating European countries, but there are variations between countries, as summarised in Figure 1. The graph shows that overall, engineering academics' preference is towards research and the Europe-wide figure is that about 70% of university engineering academics have such a leaning. At least 70% of the academics from nine of the 12 countries had this research focus.

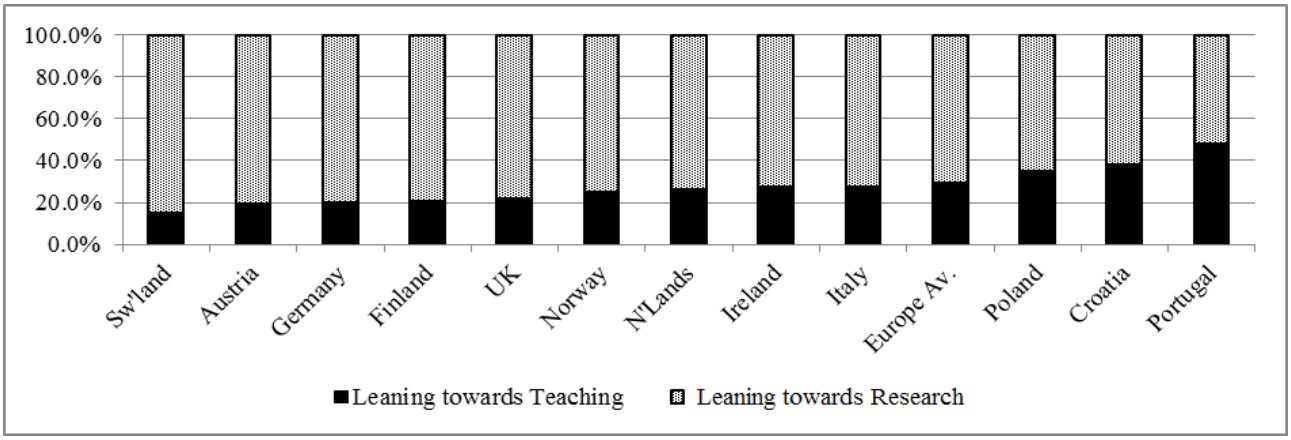

Figure 1: Propensity to prefer research or teaching by country.

At the upper end, around 85% of Swiss academics had a research leaning, down to around 50% in Portugal. In fact, 80% or more academics from Switzerland, Austria and Germany expressed an interest primarily or leaning towards research, a pattern that can be contrasted with the situation in Poland, Croatia and Portugal.

- How do teaching and research relate to each other?

Among the questions in the extensive CAP survey were two that have been analysed here as a way to look at the teaching-research nexus as far as European university academics in engineering are concerned. The first of these invited academics to indicate their views on was whether they thought that *Teaching and research were hardly compatible with each other* (CAP Question B5-7). The other question asked academic respondents whether *Your research activities reinforce your teaching* (CAP Question C4-11).

- Are teaching and research compatible?

Respondents had to respond on a five-point Likert scale, from *strongly agree*, through to *strongly disagree* with the statement whether *Teaching and research are hardly compatible with each other*. Generally, European respondents in engineering, and the European academic population overall, had similar views on this matter. For both groups, in round figures, about 40% agreed that teaching and research are hardly compatible, about 20% were neutral on the matter and about 40% of engineers disagreed. However, even if the overall populations produce similar results, it is appropriate to test this proposition according to respondents' preference for teaching over research (or *vice versa*), and also to see if there are national differences.

This question was a major one in the CAP survey, because it provided the opportunity to test opinions about the teaching - research nexus. In particular, it makes it possible to find out whether academics' particular focus towards either teaching or research affects their opinions about the compatibility of teaching and research. It also allows for an international comparison of opinion about the intersection between the two major components of an academic career. These matters are investigated in Figures 2, 3 and 4. This question was not posed in the Croatian CAP survey.

Figure 2 compares the attitudes of engineering university academics with a leaning towards teaching in the participating European countries. The base of the column measures the extent to which academics agreed with the proposition that *Teaching and research are hardly compatible with each other.* As can be seen, fewer than 20% of teaching-focussed academics from Norway, Ireland, Italy, Switzerland and Germany agreed with the statement, compared with over 50% of Polish academics and more than 40% of Finnish and British academics.

In the main, the countries with the lowest levels of agreement were the same countries with the highest levels of disagreement that *Teaching and research are hardly compatible with each other*. A higher proportion of academics from some countries were neutral on the issue, particularly Germany and Finland.

These results are an indication that academics in some countries perceive a disjuncture between teaching and research, and in Fox's terms [2], teaching-focussed academics from Poland, the United Kingdom and Finland perceive competition between teaching and research, whereas teaching-focussed academics from Norway, etc, do not.

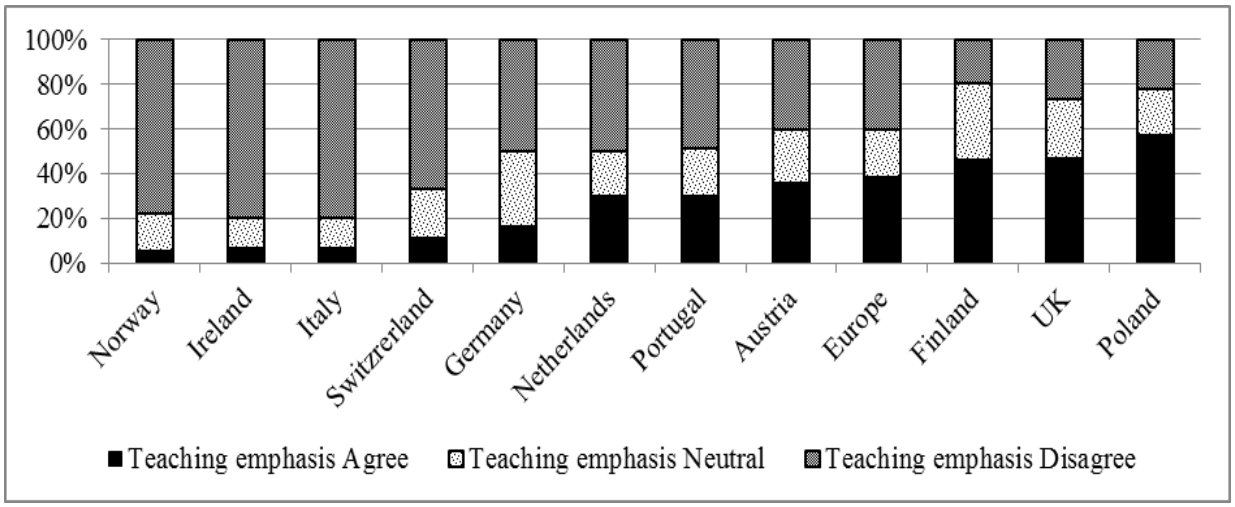

Figure 2: Opinion of university engineering academics with a leaning towards teaching: *Teaching and research are hardly compatible with each other*. Ranked according to level of agreement - low to high.

Figure 3 examines the same phenomenon for academics with a leaning towards research. Few of this group of academics from Ireland, Italy and the Netherlands in particular agreed with the statement that *Teaching and research are hardly*

compatible with each other, with reciprocal respondents being either neutral in their opinion or in disagreement with it. With the exception of research-leaning engineering academics from Poland, of whom more than 40% agreed with the statement, fewer than 30% of research-focussed academics thought teaching and research were incompatible.

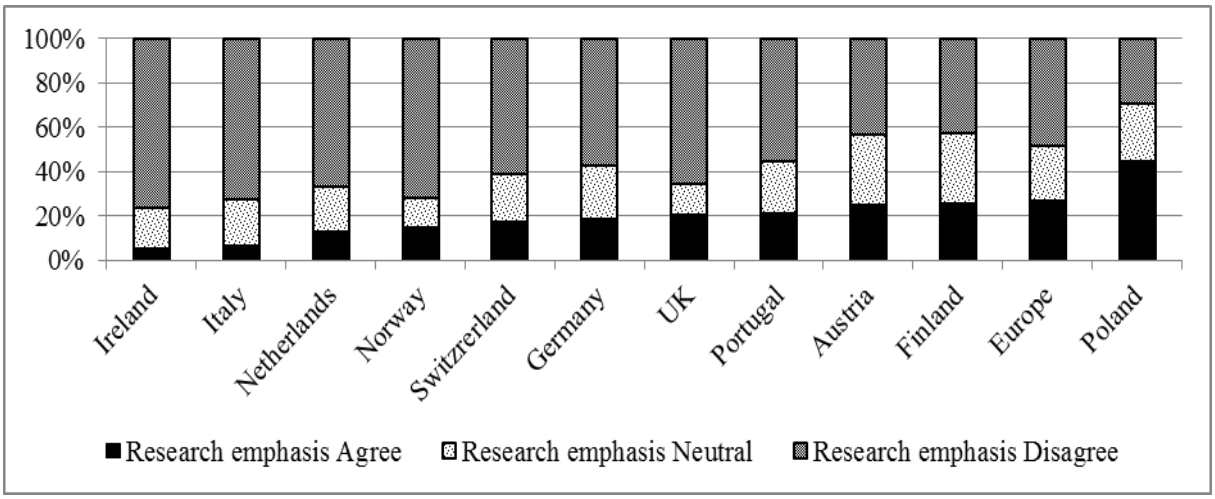

Figure 3: Opinion of university engineering academics with a leaning towards research: *Teaching and research are hardly compatible with each other*. Ranked according to level of agreement - low to high.

As a final word on this issue, Figure 4 shows a comparison of the attitudes of teaching-leaning and research-leaning engineering academics within participating countries. In most countries, these two sets of separately-focussed academics shared opinions about teaching and research being compatible. This figure is sorted according to the extent of the difference of opinion among academics in each country. Taking the extremes, in Italy, there was a 0.3% gap between the opinions of teaching- and research-oriented academics, respectively, whereas in the United Kingdom, the gap was over 26%. The gap in opinion was nearly 21% in Finland and 17% in the Netherlands, but in most countries, the gap was in the range 6% to 12%.

In countries in which there was a considerable difference between university engineering academics with a preference for teaching or research, the tendency was for teaching-oriented academics to agree that *Teaching and research are hardly compatible with each other*. This was the situation in Portugal, Austria, Poland, the Netherlands, Finland and the United Kingdom, as well as for Europe overall. The reverse pattern can be observed in Switzerland and Norway, but the differences are not great.

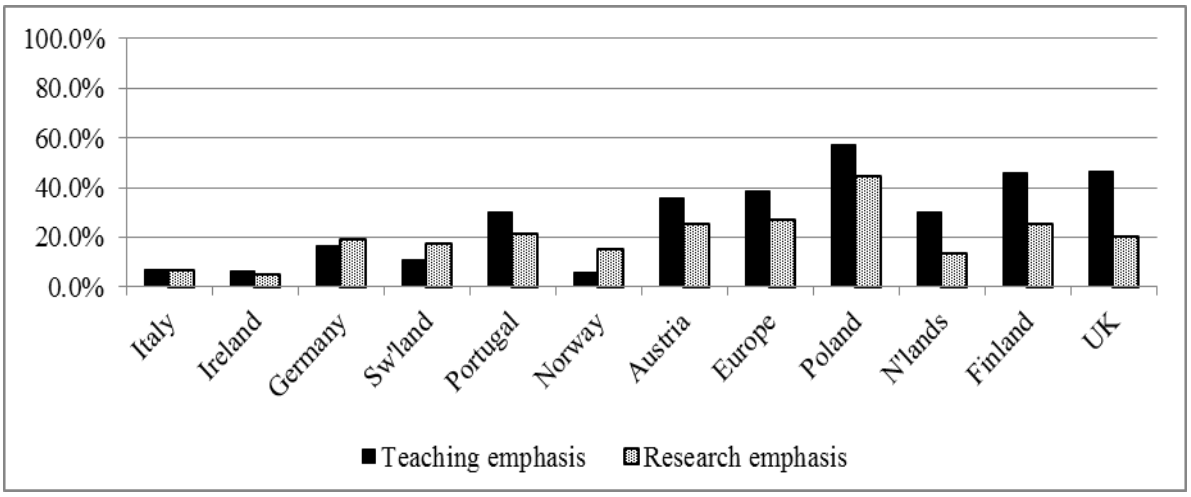

Figure 4: Opinion of academics with a leaning towards teaching or research: proportion that agree that *Teaching and research are hardly compatible with each other*. Ranked according to level of disparity - low to high.

Therefore, it can be seen that university engineering academics' opinions in most participating countries, whether they had a leaning towards teaching or towards research, were reasonably close in most countries. The United Kingdom, Finland, and to a lesser extent the Netherlands, seemed to have the greater difference of opinion between academics of different orientations.

- Do academics' research activities reinforce their teaching?

Participants had to respond on a five-point Likert scale, from *strongly agree* with the statement, through to *strongly disagree* whether *Your research activities reinforce your teaching*. In Figure 5, national patterns for university engineering academics with a leaning towards teaching are shown. There is considerable national variation in reaction to the proposition. In Poland, only slightly more than 30% of teaching-oriented university engineering academics agreed, compared with over 90% of their Irish colleagues.

According to the Europe-wide average, about half of engineering academics agreed. Looking at academics that disagreed with the statement, about half of Swiss engineering academics did so, over 30% of Dutch academics, but typically fewer than 20% of teaching-oriented university engineering academics disagreed that their research activities reinforced their teaching. This was even the case in Poland, but in that country, about half of the engineering academic population were neutral on the issue.

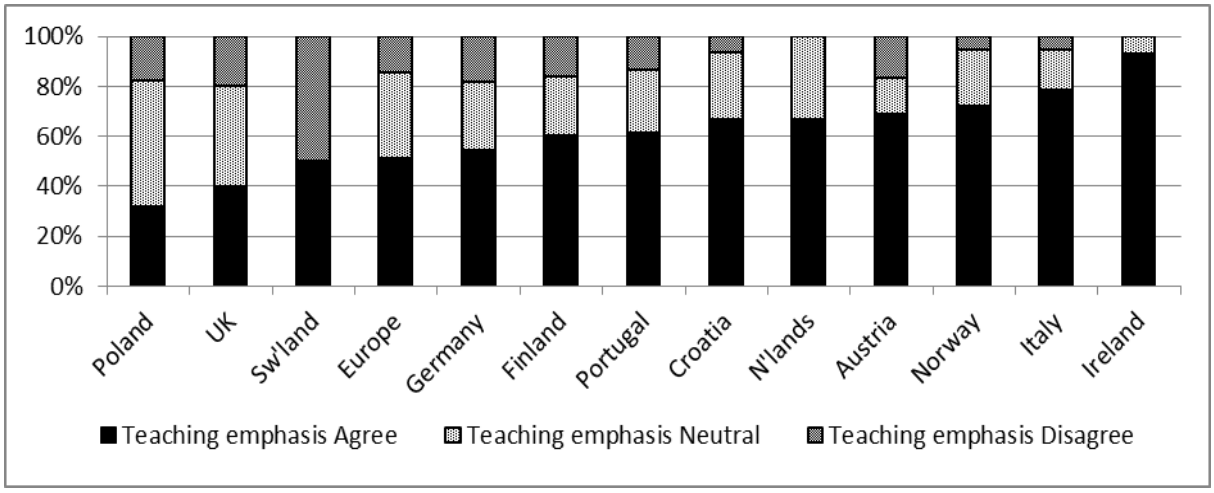

Figure 5: Opinion of academics with a leaning towards teaching: proportion that agree that *Your research activities reinforce your teaching*. Ranked according to level of agreement - low to high.

A higher proportion of research-oriented academics supported the notion that research reinforced teaching. This is demonstrated in Figure 6. Even in Poland, over 60% of research-oriented academics agreed, but in most countries the proportion ranged from 70% to 90%. All but a few of the Irish engineers supported the notion. The proportions that reported a neutral stance, or a negative one, were few in number across Europe.

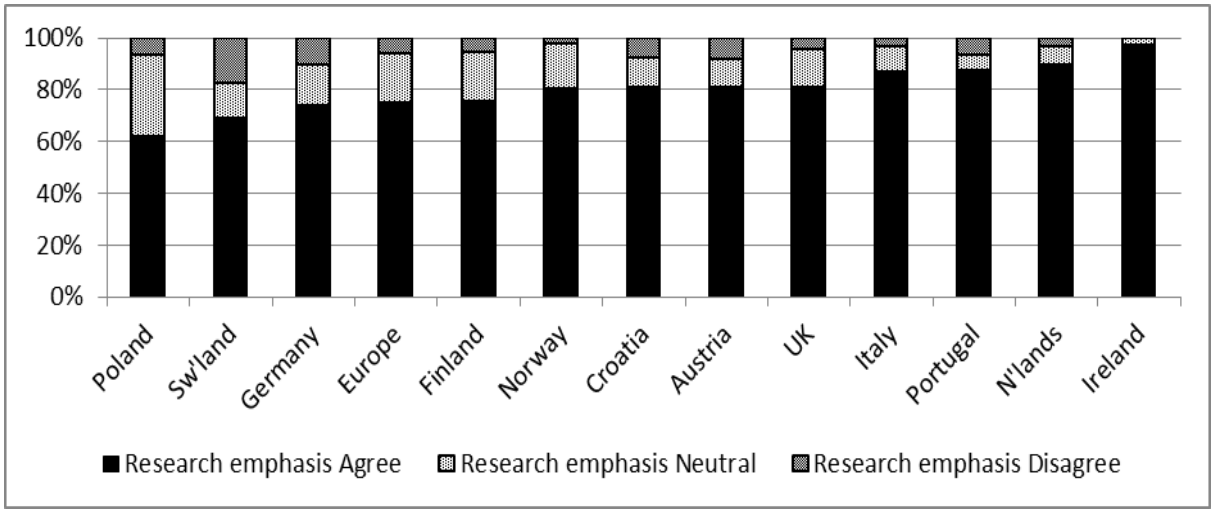

Figure 6: Opinion of academics with a leaning towards research: proportion that agree that *Your research activities reinforce your teaching*. Ranked according to level of agreement - low to high.

Finally, Figure 7 compares teaching-oriented and research-oriented university engineering academics, highlighting the proportion of each that supports the notion that their research reinforces their teaching. In all countries, a higher proportion of research-leaning academics agreed, but the gap between teaching- and research-oriented opinions varied.

As was the case with opinion about the compatibility of teaching and research, academics from the United Kingdom were the furthest apart, with the difference being more than 40%. In Poland and Portugal, the gap was close to 30%, but in Ireland, Norway and Italy, it was less than 10%.

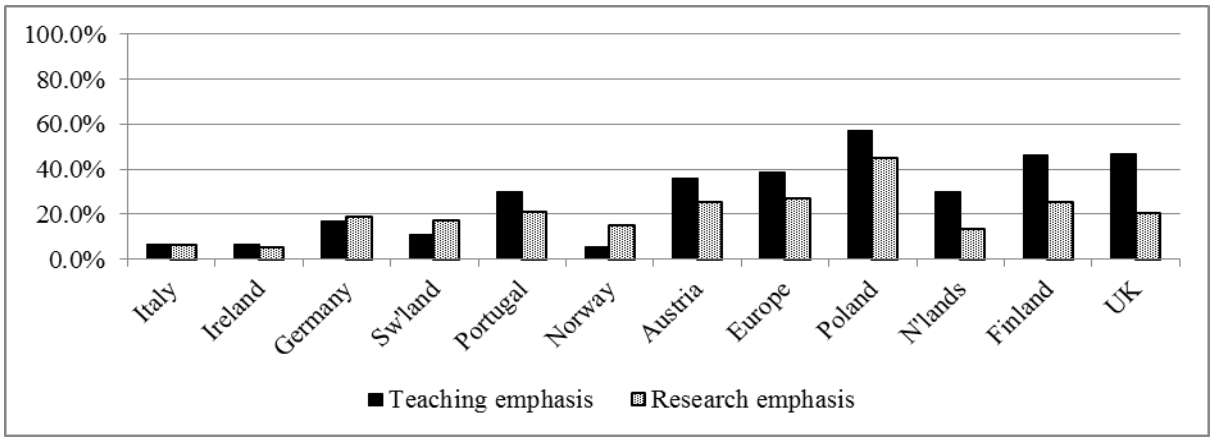

Figure 7: Opinion of academics with a leaning towards teaching or research: proportion that agree that *Your research activities reinforce your teaching*. Ranked according to level of disparity - low to high.

DISCUSSION AND FURTHER RESEARCH

The aim of Bologna agreement and subsequent communiqués is to create borderless European higher education. However, there are several reasons that mean that the results generated by surveys such the CAP survey could lead to skewed results.

First, the differences in preference might be explained by the fact that some countries have binary education systems. For example, Finland, Germany, the Netherlands and Switzerland have a second tier of higher education institutions that also teach engineering (and other disciplines). Such institutions can typically be described as polytechnics, and now are often referred to as universities of applied sciences. They tend to have been established as predominantly teaching rather than research-focussed institutions. It is possible that academics from universities in such countries will have a greater interest in research than teaching.

Second, not all differences between countries can be explained by binary higher education. Higher education can be different from one country to the next for cultural and historical reasons. For example, Finnish universities have what amounts to an apprenticeship system, whereby young PhD students are hired on short-term contracts while they undertake a PhD. Typically young Finnish academics start their careers as researchers, rather than teachers, with teaching being a greater focus in the eyes of more senior academics.

Another reason that could have an impact on responses from engineering activities is that the teaching of engineering typically requires more hours than many other disciplines, particularly undertaking laboratory or other practical classes. Accordingly, there could be a more than average number of teaching oriented academics in the engineering sample. Many engineering academics might, therefore, identify a preference for teaching, because they can find too few hours to undertake research. Further, there is a continuing trend that is slowly blurring the boundary between teaching and non-teaching periods. Whereas it used to be the norm that academics used non-teaching periods to do most of their research, many systems have seen an *expansion* of teaching periods, such as providing continuing education or remedial teaching. Such incursions into *research time* could also have an impact on academics' preference for research.

Finally, it is possible for there to be sample bias. In this article, the authors did not seek to control for gender or seniority, two factors that can provide a partial explanation for sample differences.

Further research into engineering academics' opinions could include a deeper examination of accreditation requirements in the range of countries. It takes fewer years' training in some countries than others to become *job ready*. Even if the Bologna agreement has forced nations into using a common nomenclature for qualification levels, it is not certain that *Bachelor* and *Master* have the same meaning in different countries. For example, in some countries (the United Kingdom, for example), a Bachelor degree is the level required to allow a graduate into the labour market. In other countries, such as Finland, a Bachelor degree does not qualify a graduate in most disciplines for the workforce. Does this mean that a *qualified* engineer from some countries is less prepared than a *qualified* engineer from another? It seems unlikely that this would be the case, but deeper analysis of material that is not part of the CAP survey would be required to respond to this question.

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BIOGRAPHIES

Timo Aarrevaara is Professor and Head of the University of Helsinki's Higher Education, Organisation and Governance unit. He also holds a Docent's position in administrative science at the University of Tampere. Professor Aarrevaara has professional experience in public administration as well as in research and teaching. He is a member of the boards of the Finnish Graduate School in Higher Education Administration, Management and Economics, and the Consortium of Higher Education Researchers in Finland. He has been active in higher education quality assurance auditing in Finland and is the principal investigator in the Finnish Changing Academic Profession (CAP) and the EUROAC - Academic Profession in Europe projects.

Dr Ian R. Dobson was a career administrator, predominantly in strategic planning and statistical analysis from 1971 to 2005, working with RMIT, the University of Melbourne and Monash University. Since then, he has been a freelance researcher, editor and consultant, and was a research director at the University of Helsinki between 2010 and 2012. He has had about 70 publications of journal articles and book chapters on topics such as student progress, university funding, access and equity, academic and professional staffing, and in recent years on the changing academic profession. Recent projects have been on university science enrolments in Australia, uptake of the STEM disciplines in Europe and an analysis of humanities enrolments in Australia. He also edits the Journal of Higher Education Policy and Management and the Australian Universities' Review. He is a co-resident of Australia and Finland.