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RANKING LISTS AND EUROPEAN FRAMEWORK PROGRAMMES: DOES UNIVERSITY STATUS MATTER FOR PERFORMANCE IN FRAMEWORK PROGRAMMES?

Sense Publishers

ABSTRACT

The operational context for higher education institutions has become increasingly competitive: universities have to compete on national and international markets for students, staff, funding and prestige. In this context, universities have increasingly become to think of themselves as actors who are in direct competition with others, and adapt their strategies to increase their status and survive in the new environment. The possibly best-known approach to measuring the status of universities is through the various ranking lists. Though focusing on different indicators like scientific performance or reputation, ranking lists can be considered as a mechanism for highlighting and even creating status hierarchies and providing information about the "market value" of universities. They have also contributed to the proliferation of various national policy schemes fostering elite universities, which aim to redress the dominance of US universities in the ranking lists.

An increasingly important funding source for universities is the EU Framework Programmes, where the European Commission funds basic and applied research with industrial and societal relevance. The aim of our chapter is to explore whether established university rankings in their current form are appropriate instruments for predicting the performance of universities in the EU Framework Programmes and whether university's status has an influence on its access to FP funding. To address this question, we analyse the relative influence of two different university rankings on the performance in the EU Framework Programmes, while controlling for other factors like previous experience, availability of national funding sources, university size, relational capital, and institutional factors (EU membership age and English language).

A.N. Other, B.N. Other (eds.), Title of Book, 00–00.

INTRODUCTION

The operational context for higher education institutions has become increasingly competitive: universities have to compete on national and international markets for students, staff, funding and prestige. The emergence of various markets, market mechanisms and competition in higher education have become a well-established and much discussed fact, and have shaped the dynamics of the higher education arena (Enders & Jongbloed 2007; Texeira et al. 2004) In a global competition of knowledge societies, higher education institutions have been vested with the task of economic and social change, and are expected to contribute to the competitiveness of nation-states as well as their local communities.

In this context, universities have increasingly become to think of themselves as actors in direct competition with others. They have had to adapt their strategies and even organisational structures in order to survive in the new environment (Enders & Jongbloed 2007; Clark 1998).

The ubiquitous ranking lists have emerged as the possibly best-known approach to measuring the status, and thus competitiveness, of universities. Though focusing on different indicators like scientific performance or reputation, ranking lists can be considered as a mechanism for highlighting but also creating status hierarchies, and they also provide information about the universities. Although often criticised for their idiosyncratic nature, rankings have been used in far-reaching political decisions, and thus have become an inevitable indicator for the strategic governance of national education systems and an important instrument for university management (Hazelkorn 2007, 2008).

An increasingly important funding source for universities are the EU Framework Programmes (FPs), where the European Commission funds basic and applied research with industrial and societal relevance. Established in 1984, the FPs have emerged as one of the primary tools for the European Union to implement the European Research Area, facilitating research and encouraging networking and cooperation between various knowledge producers, including universities, other higher education institutions, research institutes and industry. EU FPs are aimed at creating durable cooperation links and better integration and coordination of research efforts across the European Union, thus enabling Europe to gain leadership in key scientific and technology areas. They comprise various research funding activities, linking excellent European research actors in transnational R&D networks (van der Wende & Huisman 2004). Thus, since the 1980s, the EU FPs represent one of several alternative funding opportunities that universities increasingly rely on since in virtually all European countries, total government university funds (mainly general university funds) have decreased (Geuna 2001).

The performance of a university in the EU FPs can be quantified in various ways, e.g. by the number of participations, the number of partners, the ability to initiate projects and form consortia or the amount of acquired project funding. While a number of studies has investigated various determinants for participation and collaboration in EU FPs (Nokkala et al. 2008; Paier & Scherngell 2008; Geuna 1998), the relationship between university rankings and the performance of organisations in EU FPs has not yet been made a subject of discussion.

The aim of our chapter is to explore whether established university rankings in their current form are appropriate indicators for predicting the performance of universities in the EU FPs, and whether a university's status influences its access to FP funds. Thus, we analyse the influence of two different university rankings on EU FP performance while controlling for other factors like previous experience, availability of national funding sources, university size, relational capital, and institutional factors (EU membership age and English language). The central questions for this chapter are:

a) How important is the ranking position of a university for a high involvement in the EU FP? Which means: can we identify a relation between the ranking of a university and on the one hand, the number of its participations, and on the other hand, the number of coordinated projects?
b) Which of these rankings are good predictors for success in the EU FP market, and can these be associated with the specific focus of these rankings? Thus, is there a difference between, e.g., the *THE* and the *ARWU* rankings with respect to this third party funding market?
c) Which other factors like human resources, funding opportunities, FP experience, and relational capital can we find that also determine a university's involvement in the EU FP?

We employ a standard Poisson regression framework in light of the true integer nature of FP performance measured by the number of project participations and project coordinations.

The structure of the chapter is as follows: We will first briefly visit the current trend of expanding and stratifying research outputs, and investigate the role of ranking lists in higher education. Thereafter, we outline the methodology of the study, and the data used. We will then elaborate the construction of the dependent and explanatory variables. We will describe the results of the regression analysis, and finally conclude with a discussion on the relevance of ranking lists for the university performance on FP markets.

INCREASINGLY PROLIFIC AND STRATIFIED RESEARCH ARENA

One of the trends in research activity has been the overall increase in scientific knowledge production and the vertical stratification of knowledge producing institutions. Academic research, although accounting for a minority of all R&D activities, has enjoyed an increase in the OECD countries during the past decades. The share of the higher education sector of the R&D performed in OECD countries has increased from 14.5% in 1981 to 17.4% in 2003. Following the increase in R&D expenditure, also the scientific output has increased by 39% from 1988 to 2003: from 466,000 to 650,000 new scientific articles published annually. While the main driver for this may be seen in the massification of higher education, which alongside new students has brought new, often research-active staff, also the academic culture has changed to emphasise quantitative research output as

important for the advancement of ones academic career. Similarly, competition-based funding schemes and research assessment exercises introduced in several countries also provide incentives for more research productivity. Statistics also show a concentration of research outputs into fewer units, especially so in United Kingdom and United States. In 2002, nine UK universities received 47% of all public research funding, and in US the top 100 of the 3,600 higher education institutions received 51% of all public, i.e. federal and local, research funding (Vincent-Lancrin 2006.)

Of the research outputs produced, a growing number are result of international collaboration. In the United States, the share of internationally co-authored scientific articles more than doubled from 1988, amounting to over 23% in 2001. In Western Europe the development is even stronger, with the share of international articles increasing from 17% in 1988 to 33% in 2001 (Vincent-Lancrin 2006). This development has been supported by the European funding schemes providing incentives for European research collaboration, most prominently the EU FP, which form a particular subset of research markets and a competitive arena for research collaboration funds.

Universities are key actors in European R&D collaborations. Universities are central knowledge producing institutions, thus universities are desired partners in collaborations for other knowledge producing organisations. Universities take part in about 25% of all participations since FP1 (Barber et al. 2009). Although financial incentives and resource (inter)dependence are significant motivations both for universities (Geisler 1995) and for individuals to participate in FP collaborations, also intellectual motivations and opportunities for interdisciplinary collaboration, gaining experience and increasing the international visibility of units play a role in decisions about FP collaborations (Pohoryles 2002, Hakala et al. 2002).

Besides other public research organisations, also universities often act as mediator of the knowledge produced in R&D collaborations: Almendral et al. (2007) have shown that without universities as part of R&D partnerships, companies would be more inclined to form small cliques and be less likely to share knowledge.

RANKING LISTS AND UNIVERSITY STATUS

Gaining popularity first in the United States with the launch of the US News and World Report's America's best Colleges ranking in 1983, university rankings were first designed to aid student customers to choose between universities (Sanoff 2007). In an increasingly competitive higher education environment with high tuition fees etc., rankings have become ubiquitous. Both consumers of higher education (students, employers), and funders of higher education (public authorities, parents) want to know how to best invest their resources and were to get best value for money. Universities are increasingly using their ranking position as a marketing tool for attracting students, both nationally and internationally.

During the current decade, higher education rankings have transcended national borders, and several international rankings have been produced. Usher and Savino (2007) attribute the first international ranking to the Asiaweek Magazine, which ranked Asian universities first in 1997. The most famous of the international rankings are, perhaps, the *Shanghai Jiao Tong University's Academic Ranking of World Universities (ARWU)*, first published in 2003, and the *Times Higher Education's World University Ranking (THE)*, first released in 2004. International ranking lists have laid more emphasis on the research quality and reputation of universities. Despite there being little evidence of a positive link between research quality and the quality of undergraduate teaching, visible high research quality translates easily into prestige, either through explicit ranking lists or more elusive reputation, which in turns translates into successful undergraduate recruitment: being ranked to the top tier of ranking lists has substantial benefits for the applicant pool of universities (Bowman & Bastedo 2009). Good performance in all ranking lists, be their criteria based on research out-put indicators, or reputation and prestige, help universities´ competitiveness in all areas: success in research-based prestige is therefore closely tied to the success attracting students and scientific labour force.

Ranking lists provide information for the universities about their own market value and thus enable them to make strategic decisions about the positioning in various markets. Universities also increasingly consider the standing in ranking lists when selecting cooperation partners; the prominence of ranking lists is causing pressures to establish partnerships with top ranking universities. These pressures are likely to increase further in the future, and may lead to a further stratification of research collaborations (Hazelkorn 2007, 2008).

The interest in ranking lists is not, however, limited to students and their parents, interested in study opportunities, to academics looking to further their career or to university managers making strategic decisions. The ranking lists also have an effect on national higher education policies, and have lead to policies which induce greater stratification and concentration of elite researchers. With research being the most international of higher education activities, by the fact that production and validation of knowledge is international, and, as Marginson and van der Wende (2007, 313) point out, "because the research standing of HEIs and nations feeds into both their capacity to produce globally salient outputs and their generic attractiveness to other HEIs, to prospective students and to economic capital", the global university rankings have potentially significant effects on the higher education and research policy. In societies striving to create a knowledge-based economy, high ranking universities can be seen both as symbols of national achievement and as engines of economic growth (Marginson & van der Wende 2007).

Several countries have established policy initiatives to create so called 'World Class Universities' (Salmi 2009). Recent European policy initiatives aimed at encouraging stratification and higher ranking positions, include the university excellence initiative in Germany (Kehm 2006), the ongoing university mergers in Finland (Tirronen & Nokkala 2009) and the change of the university law and

related university mergers in Denmark (c.f. Brink Andersen 2006). Policy incentives used to boost the standing of some national universities may, however, also result in the lowering of the standing of others, thus producing little over all gains for the national higher education system (Marginson & van der Wende 2007). The quest for world class universities, accelerated by the international ranking lists, may even distract from other, equally important goals of national higher education systems (Deem et al. 2008). The international rankings sediment the established hierarchy of universities especially close to the top of the list: "In effect, the STJU and *Times* rankings tend to both reproduce and exacerbate the existing vertical differences in the higher education landscape" (Marginson & van der Wende 207, 320). If ranking success turn out not to be significant for the universities' performance in the European Framework Programmes, which have become an increasingly important funding source for universities, this call into question the rationality of emphasising elite university policies especially in small higher education systems where possibilities of attracting significant non-public research funds are few.

MAIN HYPOTHESES AND THEORETICAL BACKGROUND

As illustrated before, rankings and league tables are intended to serve as a tool for measuring scientific excellence or perceived quality of the knowledge a university offers. The participation of universities in the European Framework Programmes has been found to be determined by several factors, among them research productivity, university size, and country as well as field specificities (Geuna 1998). Departing from this state of knowledge, we find to find out whether the ranking position of a university – representing its status and prestige – is able to additionally influence the involvement of universities in the EU FP.
We analyse these issues in the light of three different perspectives that we have derived from the discussion in the literature, from first empirical insights and from a research policy point of view. These perspectives can be understood as hypotheses for the subsequent analysis.

H1. Size matters –a resource-based perspective

Large universities, i.e. universities with a high number of total staff, are equipped with abundant resources for a successful engagement in the Framework Programmes. A high number of scientists is associated with a high amount of scientific expertise, which allows the university to participate in many projects in different disciplines. Sufficient technical and administrative staff provides an appropriate infrastructure for ambitious research and coping with bureaucratic necessities.

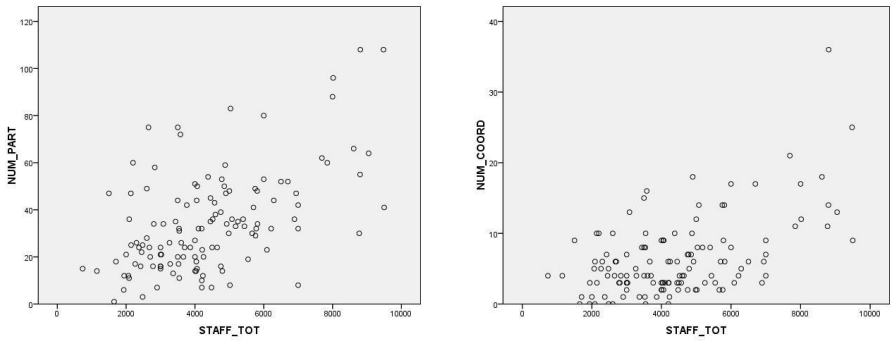

Figure 1: Top-ranked universities in FP6: number of project participations and coordinated projects by university size[i]

Frequent critiques towards ranking lists are related with the influence of university size: Large universities tend to be ranked higher than small ones (Marginson & van der Wende 2007). There are different ways to deal with this problem: While the *THE* ranking takes the size explicitly into account for (only) 50% of its indicators, *ARWU* weighs the overall final score by the number of research staff. Nevertheless, the discussion on an adequate consideration of university size is still ongoing.
Thus, we hypothesise that higher ranked universities (i.e. larger universities) are involved more often in EU FP projects.

H2.Experience matters – a trajectory-based perspective

Universities which participated intensively in the 5th EU FP and coordinated many projects are experienced actors in the European Research Area. They are familiar with the formal requirements for setting up successful project proposals as well as with the initiation and coordination of collaborative arrangements with research partners. Based on their experience in FP5 these universities are highly involved in research projects and coordinating activities in FP6, too.

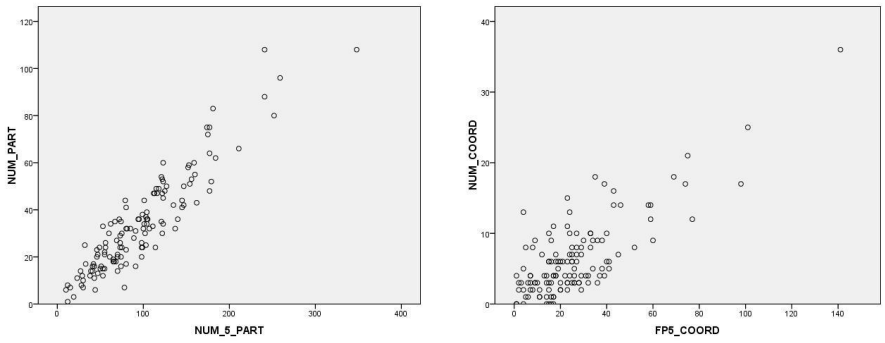

Figure 2: Top-ranked universities in FP6: number of project participations and number of coordinated projects in FP6 versus FP5[ii]

Recent research has revealed that prior acquaintance is by far the most important determinant for partner choice in EU FP projects (Nokkala et al. 2008, Paier & Scherngell 2008). Public rankings, which have been addressed relevance in new partner search (Hazelkorn 2007, 2008), thus are only relevant for a small proportion of players.

Taking this into account, we do not expect a strong influence of ranking positions on participation (consortium building). However, there might be a positive influence of ranking positions on coordination, since a high reputation of the project coordinator may affect the standing of the project positively.

H3. Funding opportunities matter – a networked economy perspective

A country's GDP is higher if its industry is more competitive and its products are better, i.e. more knowledge-intensive (OECD 1996). Universities as knowledge sources for industry are usually located geographically close (Scherngell & Barber 2009). Thus, universities in 'rich' countries are more used to the specific rationality of industrial research and acquisition of project funding. We are led to assume that they are more successful players in the EU FP as well, since its mission is to foster science-industry collaboration and industrial relevance of university research.

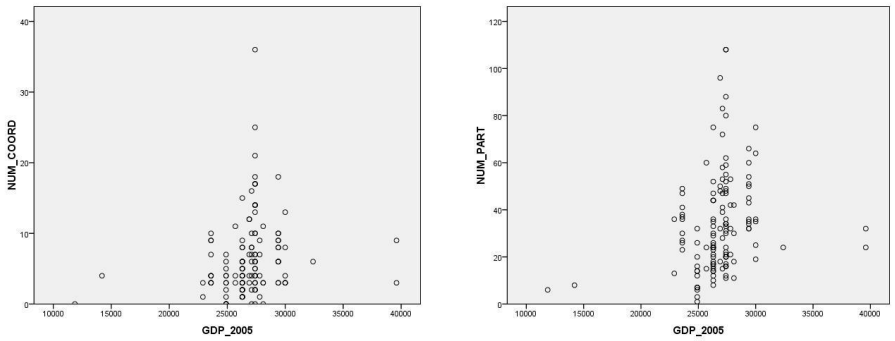

Figure 3: Top-ranked universities in FP6: number of project participations and coordinated projects versus per capita GDP of their home countrie[iii]*s*

University rankings on the other hand are intended to reflect scientific excellence more than industrial relevance, and thus we expect that the participation and coordination numbers of a university are not influenced by its ranking position a lot.

METHODOLOGICAL APPROACH AND MODEL SPECIFICATION

In this chapter we employ econometric models for hypothesis testing. We focus on the influence of university rankings – as a proxy for excellence – on the participation of universities in the EU FP. With the *ARWU* and the *THE* rankings we use two of the most famous worldwide university rankings and try to quantify their importance within the different explanation attempts. According to the three hypotheses (trajectory-based, resource-based, and networked economy perspectives), we build three groups of models and control for additional factors that potentially influence the involvement of universities in the EU FP: Human resources, funding opportunities, FP experience, and last but not least, relational capital (*Table **1***).

The models we use are Generalised Linear Models[iv] estimated by Maximum Likelihood. Given the true integer nature of the FP participations and coordinations we employ a standard Poisson regression framework. The statistical calculations are performed with SPSS, and the network analysis is done with Pajek (de Nooy et al. 2005).

Description of the model

The unit of analysis is the university. While discipline level analysis would be interesting and relevant from the perspective of the FP structure, disciplinary ranking data is only available from 2007 onwards and the FP data available after 2007 is still scarce. As we try to isolate the (trivial) influence of university size (more researchers would imply more potential project participations), we employ per capita quantities (i.e. numbers per 10,000 total staff) in our models, both for the dependent variables and the independent variables wherever this makes sense.

Table 1: Overview of dependent and independent variable[v]s

Criteria	*Variable name*	*Indicator*
Dependent variables		
FP6 participations	NUM_PART_N10000	Number of participations of the university in FP6 projects (project start after 31.12.2004) per 10,000 total staff of the university
FP6 coordinations	NUM_COORD_N10000	Number of coordinated projects of the university in FP6 projects (project start after 31.12.2004) per 10,000 total staff of the university
Independent variables		
Excellence	LOG_ARWU_INV	Ranking position of the university in *ARWU* ranking (inverted, logarithmised)
	LOG_THES_INV	Ranking position of the university in *THE* ranking (inverted, logarithmised)
Human resources	LOG_STAFF_TOT	Headcount of total staff (logarithmised)
National funding opportunities	LOG_GDP	Gross domestic product per capita 2005 (PPP) in country of origin (logarithmised)
EU FP experience	LOG_5_PART_N10000	Number of participations of the university in FP5 projects per 10,000 total staff of the university (logarithmised)
	LOG_5_COORD_N10000	Number of coordinated projects of the university in FP5 projects per 10,000 total staff of the university (logarithmised)
Relational capital	LOG_5_DEGREE	Degree centrality in FP5 (total number of partners of the university in FP5 divided by the total number of FP5 participants (logarithmised)

Dependent variables

Although the number of project participations of a university highly correlates[vi] with the number of its coordinated projects, we are led to estimate separate models for these variables, since there may be different reasons for this correlation behind, and these reasons are exactly what we hope to reveal with the selected multivariate statistical methods. In the first set of models, we choose the number of project participations of a university in FP6 normalised by university size. The second set of models uses the number of projects in FP6 coordinated by the university, again normalised by university size.

Independent variables

The independent variables are excellence measured by the university rankings and control variables defined as follows:

Excellence. The first set of explanatory variables is excellence, or the perceived quality of the knowledge a university offers to its potential project partners. We measure and compare excellence by using two different international rankings, the Academic Ranking of World Universities (ARWU) compiled by the Shanghai Jiao Tong University's International Higher Education group and the World University Ranking commissioned by Times Higher Education (THE) and conducted by Thomson Reuters (2004-2009 by Quacquarelli Symonds). Of these, the first lays great emphasis on research output as a measure of academic quality, while the second relies heavily on university reputation.

The ARWU, was first published in 2003 and is repeated annually. This uses solely research output criteria, the total score of which is modified by the per capita academic performance of the institution. The criteria, which are presented in

Table **2**, have stayed the same since 2003.

Table 2: Composition of the Academic Ranking of World Universities (ARWU)[vii]

Criteria	*Indicator*	*Weight*
Quality of Education	Alumni of an institution winning Nobel Prizes and Fields Medals	10%
Quality of Faculty	Staff of an institution winning Nobel Prizes and Fields Medals	20%
	Highly cited researchers in 21 broad subject categories	20%
Research Output	Articles published in Nature and Science	20%
	Articles indexed in Science Citation Index-expanded, and	20%

	Social Science Citation Index	
Per Capita Performance	Per capita academic performance of an institution	10%
Total		100%

The *ARWU* comprises the ranking of the top 500 world universities, and also provides separate lists of the top 100 universities in Europe North and Latin America and, Asia and Pacific area.

The ranking is somewhat sensitive to the differences of publication cultures in different fields, as the indicator detailing publications in Nature and Science is not taken into account for institutions specialised in humanities and social sciences and its weight is relocated to other indicators. If the number of academic staff cannot be obtained, the weighted total score of the other indicators only will be used. (www.arwu.org) The input proxy in the *ARWU* ranking is the size of the university with the weight of 10%. The small impact on the total score of the size of the institution has nevertheless been criticised as inadequate adjustment, which favours large institutions. Kivinen and Hedman (2008) have demonstrated how the output-oriented *ARWU* ranking does not do justice to highly productive universities operating with small inputs in terms of financial and human resources (Euros, man-years and student intake). Some critics, however, do admit the impact of university size on excellence (Taylor & Braddock 2007).

The *THE* ranking was first published in 2004, and also conducted annually. The ranking criteria have stayed more or less the same, although the survey of global employers was only introduced in 2005 (Buela-Casal 2007), before which the reputation criteria was based solely on the survey of academic peers, which originally in 2004 carried 50% weight (van Raan 2005). The current criteria and their weightings are presented in ***Table 3***.

Table 3: Composition of the World University Ranking of the Times Higher Education Supplement (THE)[viii]

Criteria	*Indicator*	*Weight*
Reputation	Survey of academic peers in five subject areas	40%
	Survey of global employers	10%
Teaching quality	Student-staff ratio	20%
Research quality	Citations per staff	20%
Internationalisation	Proportion of international students	5%
	Proportion of international staff	5%
Total		100%

The *THE* ranking comprises the list of top 200 world universities, as well as several other ranking lists, including top 50 universities in Europe and in the North America, and top 40 in the rest of the world, as well as the leading universities in various disciplines, or based on specific criteria such as citations or staffing.
The *THE* ranking has been criticised e.g. for the lack of transparency of the reputation surveys, which make up half of the weighting of criteria, for using inadequate, resource-based indicator as a proxy for teaching quality, and for allocating only 20% of the weight based on research quality (Marginson & van der Wende 2007). According to Buela-Casal et al. (2007, 355), the authors of the *THE* ranking aimed to counter the overly great advantage of the science-dominated universities in the *ARWU* in their selection of indicators for the *THE* ranking. In their own understanding of the indicators, the authors of the ranking perceive the academic peer review and citations as proxies for research quality, employer survey as a proxy for graduate employability, student-staff ratio as a proxy for teaching quality, and the proportions of international staff and students as proxies for the international outlook of the university (*www.topuniversities.com*)
As these two rankings are based on such different criteria, they make an interesting comparison from the perspective of our study. The *ARWU* emphasises explicit research output indicators, albeit concentrating on a narrow set of indicators. The *THE* ranking uses a composite approach input and output indicators, and reputational surveys, which carry considerable weight. Therefore, although there is great convergence in the top10 of both rankings, they diverge considerably further down the line.
Our comparison is based on the composite rank rather than an ordering based on the individual scores of various criteria, as the rank is more likely to be known to an average consumer of ranking lists than the score on individual criteria. Therefore it is also more likely to be the basis for decision making in collaborative arrangements. The particular ranking results to be used are the rankings of 2004, as both systems will have been available first on that year, and will therefore offer us the longest available data on the Framework Programme activity.

Human resources. This variable aims to reflect the size of the universities in terms of available expertise and research infrastructure. We measure the size of the universities by the number of total staff. Since there is no comprehensive database publicly available, we had to search for the number of academic, technical and administrative staff on the individual websites of the universities. It is a well known problem that it is rather difficult to get international comparable data on the number of researchers of universities (Kroth & Daniel 2008): some universities discriminate between different staff categories (e.g. academic, technical, administrative, clerical staff), others list only the number of their total staff; some universities list the headcount, others the number of full time equivalents (FTE); some universities include third party funded staff, others don't.

Within this study we processed the data which was most frequently available on the universities' websites, namely the headcount of the total staff, and interpreted FTE as headcounts. We used staff data from 2007. Thus, we have to be aware that the collected data in this study underlies some restrictions and can serve only as a proxy for university size.

National funding opportunities. As argued in H3, we employ the national per capita GDP as a proxy for the industry orientation of the universities, and thus for the potential of universities to acquire third party funding. The GDP data for the year 2005 are from Eurostat Gross domestic product at market prices (Purchasing Power Standard per inhabitant) (http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/).

FP experience. Most of the top-ranked universities participated in the EU FPs from the beginning; therefore we considered the number of participations and coordinated projects in FP5 to generate a distinctive factor for the FP experience of these universities.

Relational capital. We measure the relational capital of a university by using its collaborative links in the foregoing research collaborations on the European level, i.e. in the 5th Framework Programme. Hereby we take the degree centrality into consideration. The stronger the integration of the university in the research network through direct connections, the higher is its collaborative experience and his ability to extract information from these direct contacts. The degree centrality is calculated by the total number of project partners of a university in FP5 divided by the total number of FP5 participants.

Institutional factors. We consider two variables as institutional factors: EU membership age and English a native language for participants and coordinators.

Belgium, France, Italy, Luxembourg, the Netherlands and West Germany signed the Treaty of Rome 1957 and established the European Economic Community (EEC). In the following decades further European countries applied for membership and after several enlargements (1973, 1981, 1986, 1995, 2004, 2007) the European Union comprises 27 member states. We assume an influence of traditional institutional links and argue that old EU member states (like the Benelux states) have advantages towards new member states in terms of a higher number of project participations and coordinations. Furthermore, we test, if it's an advantage for coordinators and participants to be an English native speaker by introducing a language dummy variable (Ireland=1, United Kingdom=1; all other countries=0)

Data and descriptive statistics

Detailed information on funded EU projects and project participants is publicly available through the CORDIS projects database (*http://cordis.europe.eu/*). This database contains information on project objectives and achievements, project costs and funding, start and end date, contract type, etc. On project participants, the CORDIS database lists information on the participating organisation, the actual participating department, a contact person, contact details and organisation type. In practice the information on the participating organisations is quite inconsistent. Organisations are labelled heterogeneously and spelled in different languages. Entries may range from large corporate groupings, universities or research organisations to individual departments and laboratories. Thus, a comprehensive standardisation process is necessary before using this date for meaningful analyses.
Based on this data, AIT has built up and maintains the sysres EUPRO database, which currently comprises a clean and consistent dataset for FP1 to FP6 with information about 50,000 projects and as much participating organisations (Barber et al. 2008).
The analysis aims to determine the importance of the ranking position of a university for a subsequent high involvement in the EU FP, and thus focuses on FP involvement taking place after the publication of a given ranking list. Since the first university rankings by *THE* date from 2004, we had to restrict the analysis for the dependent variables *FP6 participation* and *FP6 coordinations* to projects starting after 31.12.2004 (i.e. 3,404 projects). For the explanatory or independent variable *FP experience* and *Relational capital* we refer to all projects of FP5 (i.e. 16,682 projects). Due to the lack of adequate pool of subsequent FP data, newer raking results cannot yet be used.
We identified 125 European universities in *ARWU*'s "Top 500 World universities" of the year 2004 (Shanghai Jiao Tong University 2004). ARWU provides separate ranks for the first 100 top world universities. From the ranking positions 101 to 500 they pool the ranking results in groups of 50 (between 101 and 200), and in groups of 100 (in the range from 201 and 500) (Liu & Cheng 2005). We proceeded similarly for the European universities and grouped them according to their rank in the "Top 500 World universities" list. From *THE*'s "The world's top 200 universities" of the year 2004 (Times Higher Education Supplement 2004) we extracted 85 European universities, whereas *THE* applied no groupings for lower ranked universities. We received a list of 133 universities, appearing in one or the other ranking.
The analysis is based on 124 universities in total, given that some of the universities were excluded because of lacking information on the number of total staff, and others because they never appeared as coordinators of EU projects. The universities, their position in *ARWU* and *THE* ranking, as well as the number of participations and coordinated projects are listed in the Annex. Figure 4 displays the distribution of project participations and coordinations of these universities by country. Table 4 gives an overview about the range of the values of each of the dependent as well as the independent variables.

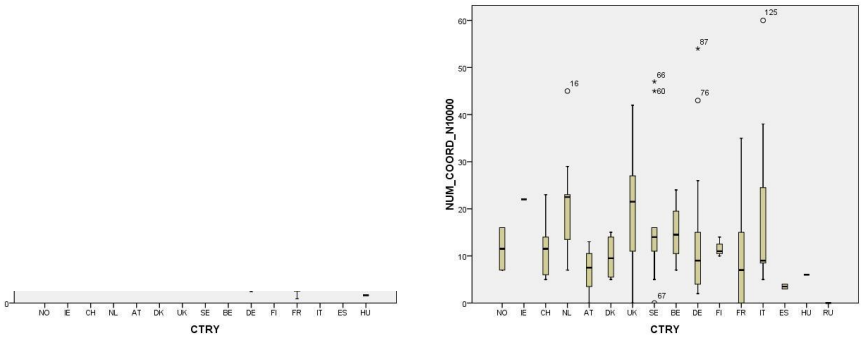

Figure 4: Number of project participations and coordinations of top-ranked universities by country[ix]

Table 4: Descriptive statistics

Criteria	*Variable name*	*Min*	*Max*	*Mean*	*St.Dev.*
Dependent variables					
FP6 participations	NUM_PART_N10000	6	313	84.35	53.388
FP6 coordinations	NUM_COORD_N10000	0	60	15.27	12.031
Independent variables					
Excellence	ARWU	1	123	57.62	33.151
	THE	1	86	59.64	27.849
Human resources	STAFF_TOT	736	9500	4385.55	1895.045
National funding opportunities	GDP	22,900	39,600	27,064.52	2,307.224
EU FP experience	5_PART_N10000	33	753	245.46	140.129
	5_COORD_N10000	2	209	63.54	41.414
Relational capital	5_DEGREE	0.00368	0.05941	0. 02641	0.01304
Institutional factors	MEM_AGE	0	52	39.60	15.848

ESTIMATION RESULTS

Referring to the initial problem statement in section '**Error! Reference source not found.**', this section describes the main findings regarding the role of scientific excellence on the involvement of universities in the EU FP. The issue was to identify the influence of two important rankings on university participation and project coordination in the EU FP. The analysis follows the explanation approaches specified in the hypotheses, namely, the resource-based, the trajectory-based and the networked economy perspectives.

First of all, we identified two important facts that hold true in all three perspectives: Institutional factors do not matter for successful involvement in the EU FP: For the number of university participations and project coordinations, it does not matter whether the university is located in an English speaking country or not. Thus, for the special case of universities in the EU FP, English seems to represent the lingua franca in practical terms. Furthermore, EU membership age of the home country does not matter, i.e. a German, French, or Dutch university does not have an advantage over a university from a new EU- or even from a non-EU member state. This might indicate that cohesion in Europe is already a reality in collaborative university research.
Regarding the role of the rankings, we find a significant influence of the *ARWU* in the resource-based model and a significant influence of the *THE* ranking the trajectory-based model, but no influence whatsoever in the networked economy model. It is important to mention that the different models are characterized by a varying set of control variables and one fixed core variable (e.g. the number of total staff of the university for the resource-based model). The results are described in more detail in the following sections. For further reference, see the statistical tables in the Annex.

Size matters - results of the resource-based model

According to our first hypothesis (H1), 'size matters', i.e. larger universities have abundant resources and cumulated experience to participate successfully in the EU FP, so their number of participations should be higher. The same is assumed for project coordination. The models discussed in this perspective are all characterized by the consideration of human resources (measured by the number of total staff).
Regarding project participations (Table 7), the resource-based model estimations reveal that high numbers of total staff are slightly supportive for high per capita participation numbers in FP6. This might indicate that larger universities have a more effective support infrastructure. The strongest positive influence on the number of participations is found with the number of coordinated projects in the foregoing FP. This is in accord with findings from interview-based research which shows that former project coordinators have a higher visibility on the partner market (Nokkala et al. 2008). At the same time, high excellence (indicated by a top *ARWU* rank) reduces the probability for participation in FP6.
Regarding the coordination of projects (Table 6), however, university size has a negative influence: Smaller universities coordinate more projects than larger universities. A high rank (*ARWU*) is conducive for becoming coordinator of a project, indicating that scientific excellence favours the leading role in a project consortium. The largest positive influence on project coordination stems from experience in the FP, mainly based on former participation, and to some degree based on former coordination.
Our results confirm the correlation between university size and ranking position (stated by Marginson & van der Wende 2007), moreover we find that *ARWU* correlates considerably stronger with university size than the *THE* ranking (Table

5). For FP5, university size is negatively correlated with the per capita participations and project coordinations.
Summing up, smaller universities with higher scientific excellence are more likely to become project coordinators, while the opposite seems to be true for mere project participation. Moreover, experience based on former participation and project coordination in FP5 matters significantly in the resource-based model. Thus, hypothesis H1 has to be rejected for project coordination and is confirmed only for project participation.

Experience matters – results of the trajectory-based model

Our second hypothesis (H2) emphasises the importance of experience in participating in the EU FP, i.e., universities with a high number of participations in the foregoing FP should have higher participation numbers and more project coordinations in FP6. Thus, the models estimated in this approach are characterized by the inclusion of FP5 participations as a control variable.
Regarding participation in FP6, projects we found a strong indication for the existence of a trajectory of being engaged in the EU FP. Universities with high per capita participation numbers in FP5 show also high per capita participation in FP6. Moreover, existing relational capital (i.e. the number of project partners in FP5, associated with the degree centrality of the university) plays a smaller but highly significant role for participation (Table 7).
More than 'having been there' seems to be required for being a frequent project coordinator: Although a high number in prior participations is still supportive, the university must have some additional experience in project coordination in the foregoing FP. Like in the resource-based model, also in the trajectory-based model scientific excellence – represented by a top position in the university rankings – is beneficial for a high number of project coordinations (Table 6). Interestingly, our results reveal a difference between *THE* and *ARWU* rankings at this point: While *THE* shows no significant influence in the resource-based model, in the trajectory-based model it is a better predictor of project coordination than *ARWU*. Again, this may reflect the fact that in contrast to *ARWU*, *THE* is size-independent, and correlates stronger with EU FP experience (see Table 5).
Summing up, we find a strong indication for a high influence of experience in project participation as well as project coordination in the EU FP. Scientific excellence is more important for project coordination than for mere participation while less influence can be attributed to university size, using the trajectory-based model. Thus, hypothesis H2 can be strongly confirmed for participation. As far as project coordination is concerned, the high importance of experience is additionally tied to scientific excellence and reputation.

Funding opportunities matter – results from the networked economy model

Our hypothesis in this explanation approach (H3) is that universities from richer countries show higher involvement in the EU FP since they are more industry

oriented and experienced in collaborative research. Scientific excellence, on the other hand, should play a less important role. Thus, in these models we estimate the influence of per capita GDP on participation and project coordination in FP6 together with a set of control variables.

The results show that universities from countries with higher per capita GDP participate more often and coordinate more projects in FP6. At the same time, these universities have high relational capital, i.e. they have many project partners (high degree centrality) in FP5 (Table 7). The number of per capita participations in FP6 increases with the number of projects that were coordinated by the university in the preceding FP – an indication that the coordinator substantially gains visibility in the research community. For project coordination in FP6, we do not find a significant influence of experience variables (Table 6), although it has to be admitted that the degree centrality – with its high and significant influence – carries some meaning of collaboration experience in FP5 **(**Table 5). Both university size and scientific excellence do not show any influence on participation and project coordination in FP6 within the networked economy model.

Summing up, we find that the collaboration experience of the university and the GDP of the country determine the involvement in the EU FP. Since university rankings aim to value the scientific excellence of universities based on research output and scientific reputation, this result supports our hypothesis that universities from countries with high GDP show a stronger orientation for applied industrial research than for fundamental research. Thus, the networked economy model confirms hypothesis H3.

CONCLUSIONS AND OUTLOOK

The EU Framework Programmes form an increasingly important performance arena for universities. This chapter explores whether established university rankings in their current form are appropriate instruments for predicting the performance of universities in the EU FP. We consider three perspectives, the resource-based, the trajectory-based, and the networked economy perspectives, and estimate corresponding econometric models with data from the sysres EUPRO database on EU FP participations. Our analysis builds on existing literature on determinants of university participation in the EU FP, but additionally considers university rankings and corrects for the size of these top-ranked universities.

According to our analysis, there is only a small influence of university rankings on the involvement of universities in the EU FP, which seems to defy the Matthew effect (c.f. Merton 1968) of high ranking positions being beneficial for all the pursuits of the university. Hereby, there seems to be a substantial difference between project coordination and mere project participation: While high scientific excellence or a good reputation is beneficial for the university to become a frequent project coordinator, this fact is less important for project participation or even hindering it. An explanation may be that the EU FP is indeed largely industry oriented and pure scientific excellence plays a minor role. Nevertheless, scientific

lead seems to be important in collaborative projects also for industry, which is more easily obtained with a high reputation of the university.

Investigating the difference between the rankings, we find a surprisingly low correlation between *THE* and *ARWU*, which leads us to expect quite different predictive power of these rankings. In fact, the *ARWU* is only significant in those cases where we take into account the size of the university: A high *ARWU* rank positively affects the number of project coordinations while it is not important to be highly ranked for pure project participations in the EU FP. The *THE* ranking, on the other hand, is significant only in the trajectory-based approach, where a high *THE* rank predicts high numbers of project coordinations.

Thus, we find that the size dependence of the *ARWU* ranking is noticeable, and it might be worthwhile to continue the discussion on size-independent measures of scientific excellence (Liu et al. 2005). The *THE* ranking – referring a great deal to reputation, which is an effect that is probably accumulated over years – appears important for the coordination of projects. The *THE* ranking position in turn, could be supported by high coordination experience in preceding FP because being coordinator of many projects generates visibility in the scientific community.

We also find prior FP experience and relational capital to be the predominant factor in determining the involvement of universities in Framework Programmes. These results support the findings of others highlighting a generally strong path dependency in the collaboration patterns of EU FP participants. From a funding perspective we find that a high per capita GDP in a country has a positive effect on participations as well as project coordinations in the EU FP. On the other hand, universities from less competitive economies seem to have potential for catching up. Finally, considering per capita numbers for the involvement in the FP we can state a smaller influence of the university size than expected.

Our results present the current elite university initiatives favoured by many European countries in a new light. Although the Framework Programmes represent one specific section of research markets, they are nevertheless an important source of research income in an environment where public budgets are squeezed; and receiving Framework Programme funding is also reflected in the reputation of the receiving research units. However, our results show that the elite university schemes aimed at boosting ranking status and thus global competitiveness of the institutions, are not necessarily a suitable way of boosting universities' FP involvement, and might even be counterproductive. Instead, fostering research capacity across the field may be a more efficient way of ensuring successful FP involvement.

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NOTES

[i] NUM_PART: number of project participations in FP6 (project start after 31.12.2004). NUM_COORD: number of coordinated projects in FP6 (project start after 31.12.2004). STAFF_TOT: headcount of total staff. Source: AIT sysres EUPRO Database; staff data from university websites.

[ii] NUM_PART: number of project participations in FP6 (project start after 31.12.2004). NUM_5_PART: number of project participations in FP5. NUM_COORD: number of coordinated projects in FP6 (project start after 31.12.2004). FP5_COORD: number of coordinated projects in FP5. Source: AIT sysres EUPRO Database.

[iii] NUM_PART: number of project participations in FP6 (project start after 31.12.2004). NUM_COORD: number of coordinated projects in FP6 (project start after 31.12.2004). GDP_2005: per capita GDP 2005 (PPP) of the university´s home country. Source: AIT sysres EUPRO Database; OECD-Eurostat.

[iv] Poisson regression is assumed to be an appropriate instrument since the dependent variable is a count variable best approximated with a Poisson distribution (see e.g. Cameron & Trivedi 1998).

[v] Note: According to the Poisson loglinear estimation model, the logarithm of the variables was used.

[vi] The Pearson correlation coefficient is equal to 0.779.

[vii] Source: Liu & Cheng 2005 and *www.arwu.org*

[viii] Source: Marginson & van de Wende 2007 and www.topuniversities.com

[ix] NUM_PART_N10000: number of project participations in FP6 per 10,000 total staff (project start after 31.12.2004). NUM_COORD_N10000: number of coordinated projects in FP6 per 10,000 total staff (project start after 31.12.2004).Source: AIT sysres EUPRO Database.

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ANNEX:TABLES

Table 5 Correlation matrix of the covariates (only variables significant in the model estimations)

		ARWU rank	THE rank	Number of total staff	GDP per capita	FP5 participations	FP5 coordinations	Degree centrality in FP5
ARWU rank	Pearson Correlation	1.000	0.587**	0.501**	0.037	0.135	0.151	0.262**
	Sig. (2-tailed)		0.000	0.000	0.677	0.131	0.093	0.002
	N	132	132	127	132	127	124	132
THE rank	Pearson Correlation	0.587**	1.000	0.215*	0.116	0.238**	0.208*	0.210*
	Sig. (2-tailed)	0.000		0.015	0.184	0.007	0.020	0.016
	N	132	132	127	132	127	124	132
Number of total staff	Pearson Correlation	0.501**	0.215*	1.000	0.034	-0.324**	-0.223*	0.394**
	Sig. (2-tailed)	0.000	0.015		0.706	0.000	0.013	0.000
	N	127	127	127	127	127	124	127
GDP per capita	Pearson Correlation	0.037	0.116	0.034	1.000	0.298**	0.116	0.326**
	Sig. (2-tailed)	0.677	0.184	0.706		0.001	0.200	0.000
	N	132	132	127	132	127	124	132
FP5 participations	Pearson Correlation	0.135	0.238**	-0.324**	0.298**	1.000	0.740**	0.645**
	Sig. (2-tailed)	0.131	0.007	0.000	0.001		0.000	0.000
	N	127	127	127	127	127	124	127
FP5 coordinatiosn	Pearson Correlation	0.151	0.208*	-0.223*	0.116	0.740**	1.000	0.381**
	Sig. (2-tailed)	0.093	0.020	0.013	0.200	0.000		0.000
	N	124	124	124	124	124	124	124
Degree centrality in FP5	Pearson Correlation	0.262**	0.210*	0.394**	0.326**	0.645**	0.381**	1.000
	Sig. (2-tailed)	0.002	0.016	0.000	0.000	0.000	0.000	
	N	132	132	127	132	127	124	132

Number of cases: n=124.

Variables: ARWU rank (LOG_ARWU_INV). THE rank (LOG_TIMES_INV). Number of total staff (LOG_STAFF_TOT). GDP per capita (LOG_GDP). FP5 participations (LOG_5_PART_N10000). FP5 coordinations (LOG_5_COORD_N10000). Degree centrality in FP5 (LOG_5_DEGREE).

Significance levels: *) significant at the 0.05 level (2-tailed). **) significant at the 0.01 level (2-tailed).

Table 6: Estimation results: Determinants of project coordination by top-ranked universities in FP6

Covariates	Coefficients (ML estimates)								
	Networked economy model			Resource-based model			Trajectory-based model		
	Magnitud	Std. Error	Marginal effect	Magnitud	Std. Error	Marginal effect	Magnitud	Std. Error	Marginal effect
Excellence									
ARWU rank	-	-	-	0.163***	(0.038)	1.177	-	-	-
THE rank	-	-	-	-	-	-	0.153***	(0.034)	1.165
Human resources									
Number of total staff	-	-	-	-0.123**	(0.045)	0.884	-	-	-
National funding opportunities									
GDP per capita	0.432***	(0.047)	1.540	-	-	-	-	-	-
EU FP experience									
FP5participations	-	-	-	0.654***	(0.123)	1.923	0.420***	(0.069)	1.522
FP5 coordinations	-	-	-	0.187*	(0.083)	1.206	0.252***	(0.075)	1.287
Relational capital									
Degree centrality in FP5	0.453***	(0.134)	1.573	-	-	-	-	-	-
Log-likelihood	-752.306			-545.335			-566.695		
Likelihood ratio chi-square test	6.904.161***			7.318.103***			7.275.383***		

Number of cases: n=124; GL regression model: Poisson loglinear
Dependent Variable: Number of coordinated projects in FP6 per 10,000 total staff (NUM_COORD_N10000).
Independent Variables: ARWU rank (LOG_ARWU_INV). THE rank (LOG_TIMES_INV). Number of total staff (LOG_STAFF_TOT). GDP per capita (LOG_GDP). FP5 participations (LOG_5_PART_N10000). FP5 coordinations (LOG_5_COORD_N10000). Degree centrality in FP5 (LOG_5_DEGREE).

Significance levels: *) significant at the 0.05 level. **) significant at the 0.01 level. ***) significant at the 0.001 level.

Table 7: Estimation results: Determinants of project participation of top-ranked universities in FP6

Covariates	Coefficients (ML estimates)								
	Networked economy model			Resource-based model			Trajectory-based model		
	Magnitude	Std. Error	Marginal effect	Magnitude	Std. Error	Marginal effect	Magnitude	Std. Error	Marginal effect
Excellence									
ARWU rank	-	-	-	-0.112**	0.037)	0.894	-	-	-
Human resources									
Number of total staff	-	-	-	0.196***	0.051)	1.217	-	-	-
National funding opportunities									
GDP per capita	0.440***	(0.066)	1.553	-	-	-	-	-	-
EU FP experience									
FP5 participations	-	-	-	-	-	-	0.898***	(0.023)	2.456
FP5 coordinations	0.379***	(0.092)	1.461	0.590***	0.089)	1.805	-	-	-
Relational capital									
Degree centrality in FP5	0.430***	(0.101)	1.537	-	-	-	0.137***	(0.035)	1.147
Log-likelihood	-1.270.939			-1.632.714			-723.435		
Likelihood ratio chi-square test	73.873.904***			73.150.354***			74.968.912***		

Number of cases: n=124; GL regression model: Poisson loglinear
Dependent Variable: Number of FP6 participations per 10,000 total staff (NUM_PART_N10000).
Independent Variables: ARWU rank (LOG_ARWU_INV). Number of total staff (LOG_STAFF_TOT). GDP per capita (LOG_GDP). FP5 participations

(LOG_5_PART_N10000). FP5 coordinations (LOG_5_COORD_N10000). Degree centrality in FP5 (LOG_5_DEGREE).
Significance levels: *) significant at the 0.05 level. **) significant at the 0.01 level. ***) significant at the 0.001 level.

Table 8: Top-ranked universities in FP6 (projects after 31.12.2004)

University name	***ARWU* rank 2004**	***THE* rank 2004**	**Number of FP6 participations**	**Number of FP6 coordinations**
University of Cambridge (CU)	1	2	108	36
University of Oxford (OU)	2	1	108	25
Imperial College London (ImperialCL)	3	5	80	17
University College London (UCL), (UOL)	4	9	88	17
ETH Zürich - Eidgenössische Technische Hochschule	5	3	64	13
Universiteit Utrecht	6	41	66	18
Universite de Paris VI (UPMC)	7	16	32	7
Technische Universität München	8	32	47	6
Karolinska Institutet	9	86	72	16
University of Edinburgh (EdinburghU)	10	13	62	21
Universite de Paris XI (Universite Paris-Sud)	11	42	26	5
Ludwig-Maximilians-Universität München	12	35	44	5
Universität Zürich - University of Zürich (UZ)	13	86	36	4
University of Copenhagen (KU)	14	19	42	9
University of Bristol (BrisU)	15	29	48	14
Universiteit Leiden /Leiden University	16	51	51	9
Ruprecht-Karls-Universität Heidelberg	17	12	44	15
University of Oslo - Universitetet I Oslo	19	37	32	9
University of Sheffield (SheffU)	20	62	49	14
University of Helsinki, Helsingin Yliopisto	21	50	60	11
University of Uppsala	22	57	53	8
King's College London (KCL), (UOL)	23	33	33	4
Georg-August-Universität Göttingen	25	27	20	6
University of Nottingham (NottinghamU)	26	72	52	17
Universite de Strasbourg I (Universite Louis Pasteur) ULP1	27	52	16	4
Ecole Normale Superieure de Paris (ENS)	28	7	14	4
Universität Wien/University of Vienna (UNIVIE)	29	31	30	11
Albert-Ludwigs-Universität Freiburg	30	86	29	2
Lund University	32	73	83	8
Universitá di Roma "La Sapienza"	33	68	41	9

University of Birmingham (BirmU)	33	47	31	10
Humboldt-Universität zu Berlin	35	46	17	1
University of Stockholm (Stockholms Universitet)	36	56	41	6
Rheinische Friedrich-Wilhelms-Universität Bonn	37	54	35	3
Bayerische Julius-Maximilians-Universität Würzburg	38	71	17	4
Christian-Albrechts-Universität Kiel	38	61	26	6
Eberhard Karls Universität Tübingen	38	86	24	4
Ghent University - RUG	38	86	50	7
Johann Wolfgang Goethe-Universität Frankfurt am Main	38	66	33	8
Katholieke Universiteit Leuven	38	86	96	12
Rijksuniversiteit Groningen	38	86	45	6
UniBe Universität Bern - University of Bern	38	86	19	3
Universitá degli Studi di Milano, University of Milan	38	86	38	4
Universitá degli Studi di Pisa, University of Pisa	38	86	26	4
Universität Hamburg/University of Hamburg	38	60	36	8
Universite catholique de Louvain	38	14	48	12
Universite de Paris VII DENIS DIDEROT (UP VII)	38	86	7	1
Universiteit van Amsterdam	38	34	50	9
University of arhus - arhus Universitet (AU)	38	48	32	4
University of Glasgow (GlasU)	38	40	34	6
University of Leeds (LeedsU)	38	53	55	14
University of Liverpool (LivU)	38	63	34	6
University of Sussex (SussexU)	38	17	17	5
Westfälische Wilhelms-Universität Münster	38	86	24	1
Cardiff University (CardiffU)	60	86	30	2
Ecole Polytechnique Federale de Lausanne - EPFL	60	8	75	8
Erasmus Universiteit Rotterdam	60	20	36	6
Johannes-Gutenberg-Universität Mainz	60	86	15	4
Philipps-Universität Marburg	60	86	14	2
Royal Institute of Technology (KTH)	60	43	58	4
Technical University of Denmark (DTU)	60	59	53	7
UAM Universidad Autonoma de Madrid	60	67	13	1
Universitá degli Studi di Torino, University of Turin	60	86	27	3
Universität Leipzig	60	86	12	1
Universität zu Köln	60	86	23	3
Universite de Montpellier II	60	86	12	3
Universite Joseph Fourier - Grenoble 1 (UJF)	60	86	20	6
University of Göteborg	60	86	39	7

University of Leicester (LeU)	60	81	20	6
University of Southampton (SotonU)	60	83	59	10
Vrije Universiteit Amsterdam	60	86	54	10
Wageningen UR (EDU)	60	86	60	10
Chalmers University of Technology	80	39	47	10
Delft University of Technology	80	24	43	3
Freie Universität Berlin	80	86	21	3
Friedrich-Alexander-Universität Erlangen-Nürnberg	80	86	16	2
Karl-Franzens-Universität Graz (KFUG)	80	86	11	0
Leopold-Franzens-Universität Innsbruck (UIBK)	80	69	18	3
London School of Economics and Political Science (LSE)	80	4	16	3
Martin-Luther-Universität Halle-Wittenberg	80	86	8	2
Politecnico di Milano	80	86	49	10
Queen Mary University of London (QueenMU), (UOL)	80	36	21	7
Radboud Universiteit Nijmegen	80	82	35	8
Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen	80	77	52	6
Ruhr-Universität Bochum	80	86	14	5
Swedish University of Agricultural Sciences (SLU)	80	86	28	0
Technische Universität Berlin	80	18	30	2
UB Universitat de Barcelona - University of Barcelona	80	86	36	3
Universitá degli Studi di Bologna, University of Bologna	80	79	47	9
Universitá degli studi di Napoli Federico II	80	86	23	3
Universität Karlsruhe (Technische Hochschule)	80	64	44	9
Universität Regensburg	80	86	10	3
Universität Stuttgart/University of Stuttgart	80	45	75	4
Universität Ulm/University of Ulm	80	86	18	1
Universite Claude Bernard Lyon I (UCLB)	80	86	14	3
Universite de Bordeaux I	80	86	6	0
Universite de Paris V (Universite Rene Descartes)	80	86	7	2
Universite Paul Sabatier de Toulouse III (UPS)	80	86	7	0
Universiteit Twente	80	86	34	3
University of Dublin - Trinity College (TCD)	80	28	24	6
University of Dundee (DundeeU)	80	70	16	3
University of Durham (DurU)	80	49	16	7
University of East Anglia (UEA)	80	86	22	4
University of Liege (ULg)	80	86	32	3
University of Newcastle upon Tyne (NCL)	80	76	47	18
University of Reading (ReadU)	80	86	20	2

University of Southern Denmark - Syddansk Universitet (SDU)	80	86	21	1
University of St Andrews (St-AndrewsU)	80	21	12	5
University of Turku, Turun Yliopisto	80	86	15	3
University of Umea (Umea Universitet)	80	86	15	2
University of Warwick (WarwickU)	80	25	36	14
University of York (YorkU)	80	55	34	13
Eindhoven University of Technology	123	26	32	6
Helsinki University of Technology, Teknillinen Korkeakoulu	123	75	24	4
Norwegian University of Science and Technology (NTNU)	123	80	24	3
Queen's University of Belfast (QUB)	123	78	20	4
Technische Universität Darmstadt	123	74	24	1
Technische Universität Wien (TU Wien)	123	23	42	3
Universität Bremen/University of Bremen	123	85	25	5
Universite de Montpellier I	123	65	1	0
Universite De Paris I - SORBONNE - PANTHEON	123	22	3	0
Universiteit Maastricht	123	44	32	8
University of Aberdeen (AbdnU)	123	84	24	2
University of Bath (BathU)	123	38	11	0