

Support for continued data collection and analysis concerning mobility patterns and career paths of researchers

Working conditions and career paths of early career researchers - Cross-Country Report (WP3)

Prepared for:

**European Commission
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0 EXECUTIVE SUMMARY

Approach

This report reflects the results of work packages 3, the case studies on working conditions and career paths of early career researchers (WP3) in selected countries of the MORE2 study on “support for continued data collection and analysis concerning mobility patterns and career paths of researchers”. It provides an overview on the working conditions and career paths of early career researchers for the countries under investigation. The analysis is based on data and information provided by an extensive network of national experts. The data collection for WP3 was undertaken in close collaboration with WP4. A uniform set of three instruments was developed and used ensuring coherence of the information and data given by the experts. For the data collection for WP3, a template was used specifically, which was completed by all country correspondents.

Key Findings

Country comparison of the working conditions and careers of early career researchers

In the majority of countries, the higher education sector is seen as an attractive sector for pursuing a researcher career.

Higher education institutions in most countries have a high degree of autonomy regarding academic, organizational and staffing issues, while they are more limited with regard to financial autonomy. While there are differences among countries and groups of countries regarding the degree of autonomy of higher education institutions these differences cannot be explained by regional affiliation.

In most countries, higher education institutions are meant to pursue research and teaching. Only a few countries distinguish explicitly between teaching-only institutions and research-and-teaching institutions e.g. Belgium, Italy, the Netherlands, Australia and Japan.

The department model, as opposed to the chair model, is implemented in HEI in the majority of countries. The institute / chair model is implemented in Austria, Belgium, Germany, Hungary, Slovenia, China and South Korea, for instance.

In most countries, only universities award doctorates and consecutive academic degrees such as the habilitation, though the latter are mandatory only in very few countries such as Russia, Bulgaria and Spain.

While structured doctoral training is not necessarily mandatory, it is nevertheless the predominant way to gain a PhD in the majority of countries. Countries where structured doctoral training is not mandatory but dominant are, for instance, Finland, Italy, the Netherlands, Poland, Portugal and Switzerland.

While there are some differences with regard to the age when a PhD is typically awarded, in the majority of countries a doctorate is earned before the researcher's 35th birthday. Particularly young (≤ 30) are those PhD candidates receiving their degree in Belgium, Cyprus, Ireland, Lithuania, Luxembourg, Serbia and the United Kingdom, particularly old are their counterparts in Brazil, Israel and South Korea (≥ 38 years).

Most positions, no matter at which career stage, are potentially “employee” positions. In R1 career stage, (doctoral) student and grant holder positions are nearly as frequently awarded. In the vast majority of the countries, researchers' careers start with temporary contracts, which, depending on the career stage, differ in terms of their length. R1 and R2 positions, in particular, are more often based on

shorter contracts. Tenure options are the exception rather than the rule in early stages of the career. The share of positions offering tenure track significantly increases at the R3 stage. The share of permanent positions also increases significantly when moving to the R3 stage. Already here, the majority of positions offer permanent contracts. Again, this share increases significantly when moving from R3 to R4.

In most countries, funding for the majority of researchers at all career stages comes from block funding. The share of positions funded by competitive funding is highest at the R2 stage, lowest at the R4 stage. Positions with competitive funding within career stages are dominant in only a few countries (e.g. Portugal and Australia in R1, Belgium and UK in R2, Sweden in R3 and Netherlands in R4).

Conditions at the various career stages vary with regard to the autonomy which researchers are given. Generally, the degree of freedom is highest with regard to academic autonomy and lowest when it comes to financial factors. Autonomy increases along the career path. In particular, moving from R2 to R3 is accompanied with increasing autonomy. And again, the move from R3 and R4 leads to more degrees of freedom, and here a significant increase towards the highest degree of autonomy can be found.

The “speed” of progressing along the career path differs between countries. In the majority of countries, researchers enter the R1 stage before the age of 30. Differences among countries seem to exist with regard to the time a researcher remains at a certain level. “Delays”,¹ can be identified at the various stages: for example it takes longer to progress from an R1 to an R2 position in Finland, Portugal and Spain, from R2 to R3 in Austria, Italy, Netherlands, Switzerland, United Kingdom and USA and from R3 to R4 in Lithuania and Portugal. In general, the countries under investigation are rather similar with regard to the age at which a specific career stage can typically be obtained. In most countries, R1-positions are obtained when researchers are under 30 years of age. In most countries (where respective information is available), R2-positions are obtained before the 36th birthday and R3-positions before the 41st birthday. In the vast majority of countries (with information available), R4-positions are obtained before the 51st birthday including a large group of countries in which these positions are obtained already before the 46th birthday. However, particularly early to reach the highest career stage (R4) are researchers in Serbia and Turkey, while in Brazil and Russia these positions are awarded significantly later.

Differences among countries exist with regard to the channels used for advertising positions. In the majority of countries they are advertised at least nationally: internationally advertising researchers’ positions is not a required standard procedure. Austria, Belgium, Iceland, Ireland, Norway and the United Kingdom, among others, advertise positions internationally. In Poland, following the Education Act (2011)², jobs are now advertised via EURAXESS too.

In the majority of countries, career progression depends, at least to some degree, on the performance of researchers.

International mobility is a prerequisite in more than a third of the countries e.g. in Germany, Hungary, Spain, Turkey and China; in an additional 17% of the countries this is true for at least selected areas. In terms of schemes to support and enhance international mobility, the countries are split into two groups of the

¹ Career delay is seen as entering the next career stage not at an age falling in the directly successive age group.

² See Deloitte (2012): The Researchers Report 2012. Country Profile: Poland. http://ec.europa.eu/euraxess/pdf/research_policies/country_files/Poland_CountryFile_2012_FINAL.pdf

same size: one group has implemented national schemes whereas the other group does not have them but, rather, relies on the European initiatives.

Similarities of career stages - classification of countries

Within career stages R1, R2 and R4, the countries analyzed show very similar characteristics - only in a minority of countries differing academic career paths have been implemented at these stages. The major dividing line within all career stages is the provision of temporary vs. permanent contracts and the offer of tenure-track-options.

Typical for career stage R1 are the following characteristics: young researchers aged 30 years or even younger are employed based on block-funded mainly temporary contracts. Their autonomy is rather low and tenure-track options hardly exist. Differentiation among countries is based on the tasks which researchers fulfill. Southern European countries, in particular, tend to employ researchers for research-only tasks, with Greece being an exception. There are however, groups of countries diverging from these general patterns with regard to the type of contract offered, e.g. Bosnia and Herzegovina, Cyprus, Estonia, Hungary, Netherlands, Serbia offer permanent contracts to early career researchers even at the R1 level. Another group of countries (Russia, Israel, Brazil) makes tenure track options available to researchers at the R1 level.

R2 positions are typically described as follows: mainly researchers in their early 30s, who are employed on block-funded temporary contracts, engaged in both teaching and research tasks, having a low level of autonomy.

One group of seven countries, Croatia, Finland, Iceland, Lithuania, Sweden, United Kingdom, South Korea, differs from these main characteristics with regard to the age, the funding regime and the task division: researchers are older, they are more frequently exposed to competitive funding and focusing on either teaching or research.

The transition from career stage R2 to R3 is, in most countries, a transition from dependence to increasing independence, which includes stable working conditions. Still, a large group of countries seems to grant independence only at the R4 career stage. The R3 career stage is the most diverse career stage. While there is a dividing line between countries regarding type of contract, task division and level of researchers' autonomy, the picture is rather scattered with regard to combinations of the characteristics and thus, there are no main features characterizing this career stage and no general description can be outlined. However, stable working conditions - which we define by the availability of permanent contracts and block funded positions - are available in 28 of the 47 countries at the R3 career stage at latest. Only Estonia, Macedonia, Latvia and Russia do not offer stable employment conditions at any career stage.

Career stage R4 is characterized by researchers who secure these positions in their 40s, are employed on block-funded permanent contracts and engage in research and teaching. We did not find any notable concentration of regions when it comes to countries being assigned to the cluster. Differentiating factors between groups, are again, whether tenure track options are available or not and level of autonomy. The group which is most distinct from the more general features of the R4 stage with mainly temporary contracts, specialised tasks (either research or teaching) and only medium level of autonomy for Croatia, Estonia, Macedonia, Serbia, and China.

In general - not surprisingly in countries where stable working conditions can be obtained at an earlier career stage - researchers tend to be younger when they obtain their first permanent contract.

In almost all countries researchers are granted research independence, at the latest, at R3, even in those countries where stable working conditions are only found at R4.

The relative attractiveness of higher education is not dependent on whether or not stable working conditions can be obtained an earlier career stage.

Country classification of academic career systems

We identified four different groups of countries with similar academic career systems.

- Cluster 1 includes a unique characteristic in terms of HEI autonomy (high), international mobility (prerequisite but not supported by national schemes) and type of contracts (mostly temporary): Estonia, Luxembourg, Russia, China, Singapore
- Clusters 2 and 3 are unique in terms of the career stage at which a certain level of research independence is reached. In Cluster 2 research independence is reached at R3 and in most cases this involves stable working conditions: Austria, Bosnia and Herzegovina, Denmark, Finland, Ireland, Montenegro, Switzerland, Australia, Canada
- Countries in Cluster 3 tend to grant research independence earlier to their academics: Albania, Czech Republic, Macedonia, France, Iceland, Italy, Latvia, Liechtenstein, Norway, Romania, Spain, Sweden, United Kingdom
- Cluster 4 can be seen as the standard cluster. Common characteristics of academic career systems in countries belonging to this standard cluster compared to the other clusters are: international and intersectoral mobility are prerequisite for certain careers, HEI have a medium to low level of autonomy, social security is rather high and career conditions vary not significantly between disciplines: Belgium, Bulgaria, Croatia, Cyprus, Germany, Greece, Hungary, Lithuania, Netherlands, Poland, Portugal, Serbia, Slovenia, Turkey, Faroe Islands, Israel, Brazil, Japan, South Korea, USA.

Geographic location of the countries is not a component that explains cluster affiliation.

1 INTRODUCTION

1.1 Objectives

The main objective of the study “support for continued data collection and analysis concerning mobility patterns and career paths of researchers” (MORE2) is (as mentioned in the Terms of Reference):

“To provide internationally comparable data, indicators and analysis in order to support further evidence-based policy development on the research profession at European and national level.”

In order to realize this overall objective, the study builds on the MORE1 results and methodologies, which will be improved, fine-tuned and expanded, where required, both methodologically and conceptually.

More precisely, MORE2 sets out to:

- I. Conduct a survey of researchers currently working in Europe in higher education institutions (HEI) regarding their mobility patterns, career paths and working condition (WP1);
- II. Conduct a survey of researchers currently working outside Europe regarding their mobility patterns, career paths and working conditions (WP2);
- III. Carry out a case study on the working conditions and career paths of early career researchers in selected countries (WP3);
- IV. Carry out a case study on the remuneration of researchers in selected countries (WP4);
- V. Develop and produce a set of internationally-comparable indicators on stocks, flows, working conditions and career paths of European researchers (WP5);
- VI. Draft a final report that provides a comparative, policy-relevant analysis of the mobility patterns, working conditions and career paths of European researchers (WP6).

This report is part of delivery D4, and its focus is on the results obtained in work package 3, the case studies on working conditions and career paths of early career researchers (WP3) in selected countries. Thus, this report provides information, data and analysis based on the country fiches for the countries under investigation, which were compiled by an extensive network of national experts. D4 consists of two additional reports: the technical report outlining the methodology applied in the two interrelated work packages WP3 and WP4 (IDEA Consult et al, 2013a) and the report on the results obtained by work package 4, the remuneration of researchers in selected countries (IDEA Consult et al, 2013b). Data collection for WP3 and WP4 was jointly collected. The methodology used for both work packages is briefly described in chapter 2; details are laid out in the common technical report mentioned above (IDEA Consult et al, 2013a).

2 DATA COLLECTION

The objective of work packages 3 and 4 is to provide detailed descriptions and an analysis of the working conditions, career paths and remuneration for (early career) researchers for 40 European countries, the USA, Canada, Japan, China, India, South Korea, Singapore, Australia, Brazil and Russia. In order to fulfill this task we used an extensive network of national experts (country correspondents). For each country, one national expert was appointed to collect the data as input for the WP3 and WP4 analysis and report. The national experts gathered the required country specific empirical information and data bases on which they compiled and provided country reports. In order to ensure coherence of the information and data, a common approach was used. Country correspondents were provided with a set of instruments³ serving as the basis for collecting the data on working conditions and remuneration of researchers. This set of instruments consisted of:

- a country correspondents' template,
- an university questionnaire and
- a RPO (research performing organization) questionnaire.

The template and the questionnaires were developed by the project team. These instruments were discussed and agreed upon with the representatives of the European Commission before they were made available to the country correspondents via a common web based platform. Together with the template the country correspondents were provided with a) guiding material explaining how to fill in the template, b) a pilot study to provide additional guidance on the content we expected in the various sections of the template and c) an agreed upon set of statistical data for each country⁴. In addition, correspondents have been provided with links to the OECD Main Science and Technology Indicators online statistics⁵ and to the European University Institutes Career descriptions⁶. Moreover, selected literature was stored on the web based platform providing relevant background information to the country correspondents. Details on the data collection and the set of instruments used can be found in the technical report for WP3 and WP4 (IDEA Consult et al, 2013a).

It was agreed with the European Commission that the focus would be on the university system in the countries under investigation and to a lesser extent on RPOs⁷. Information on the business sector was to be gathered only very selectively. Therefore, a small number of semi-structured interviews were carried out in three selected countries: Austria, Germany and Denmark. For these interviews an interview guideline⁸ was developed and the interviews were carried out by members of the project team. Due to the reduced regional focus and the limited number of interviews, the information gathered by these interviews can only provide anecdotal evidence and cannot necessarily be considered as conclusive for the business enterprises sector as a whole. Complementing the interview approach and in order to enrich the conclusions drawn from the interviews, descriptive

³ For the instrument used for data collection and the guidelines on how to use them see the technical report for WP3 and WP4 (IDEA Consult et al, 2013a).

⁴ Depending on coverage and availability. We provided EUROSTAT data, thus no data was provided for countries not covered by the respective sources.

⁵ http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB

⁶ <http://www.eui.eu/ProgrammesAndFellowships/AcademicCareersObservatory/AcademicCareersbyCountry/Index.aspx>

⁷ This work package mainly focused on the higher education sector. In order to extent the picture RPOs have been included.

⁸ For the instruments used for data collection see IDEA Consult et al, 2013a.

analyses on gross annual earnings and average hourly wages of researchers in companies using the Structure of Earnings Survey (SES) from Eurostat for 17 EU-countries were carried out.

3 ANALYSIS OF RESEARCHER CAREERS

While the main focus is on early career researchers, the attractiveness of pursuing a research career can only be assessed based on the overall layout of potential career pathways. Therefore, the various stages of a research career were addressed and data was gathered covering the overall research career path, starting from doctoral education (i.e. doctoral candidates) up to the highest achievable position in terms of the higher education system (i.e. the professorship).

For the higher education / university sector detailed information on positions available along this career path was gathered. In order to allow for country comparisons, an intermediate layer – namely specific career stages – has been introduced and country correspondents were asked to assign all positions to one of four career stages outlined and defined in the European Commission's communication "Towards a European Framework for Research Careers" (European Commission 2011, p. 2). These four career stages are:

- R1:** First Stage Researcher (up to the point of PhD),
- R2:** Recognized Researcher (PhD holders or equivalent who are not yet fully independent),
- R3:** Established Researcher (researchers who have developed a level of independence) and
- R4:** Leading Researcher (researchers leading their research area or field).

According to the definitions given in the EC's communication, the different stages are characterized as follows:

A first stage researcher (R1) will:

- "Carry out research under supervision;
- Have the ambition to develop knowledge of research methodologies and discipline;
- Have demonstrated a good understanding of a field of study;
- Have demonstrated the ability to produce data under supervision;
- Be capable of critical analysis, evaluation and synthesis of new and complex ideas and
- Be able to explain the outcome of research and value thereof to research colleagues."

(see European Commission 2011, p. 7)

Recognized researchers (R2) are PhD holders or researchers with an equivalent level of experience and competence who have not yet established a significant level of independence. In addition to the characteristics assigned to the profile of a first stage researcher, a recognized researcher:

- "Has demonstrated a systematic understanding of a field of study and mastery of research associated with that field
- Has demonstrated the ability to conceive, design, implement and adapt a substantial program of research with integrity
- Has made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, innovation or application. This could merit national or international refereed publication or patent.
- Demonstrates critical analysis, evaluation and synthesis of new and complex ideas.
- Can communicate with his peers - be able to explain the outcome of his research and value thereof to the research community.

- Takes ownership for and manages own career progression, sets realistic and achievable career goals, identifies and develops ways to improve employability.
- Co-authors papers at workshop and conferences.”

(see European Commission 2011, p. 8)

An established Researcher (R3) has developed a level of independence and, in addition to the characteristics assigned to the profile of a recognized researcher:

- “Has an established reputation based on research excellence in his field.
- Makes a positive contribution to the development of knowledge, research and development through co-operations and collaborations.
- Identifies research problems and opportunities within his area of expertise
Identifies appropriate research methodologies and approaches.
- Conducts research independently which advances a research agenda.
- Can take the lead in executing collaborative research projects in cooperation with colleagues and project partners.
- Publishes papers as lead author, organizes workshops or conference sessions.”

(see European Commission 2011, p. 10)

A leading researcher (R4) leads research in his area or field. He or she leads a team or a research group or is head of an industry R&D laboratory. “In particular disciplines as an exception, leading researchers may include individuals who operate as lone researchers.” (European Commission 2011, p. 11) A leading researcher, in addition to the characteristics assigned to the profile of an established researcher:

- “Has an international reputation based on research excellence in their field.
- Demonstrates critical judgment in the identification and execution of research activities.
- Makes a substantial contribution (breakthroughs) to their research field or spanning multiple areas.
- Develops a strategic vision on the future of the research field.
- Recognizes the broader implications and applications of their research.
- Publishes and presents influential papers and books, serves on workshop and conference organizing committees and delivers invited talks”

(see European Commission 2011, p. 11)

For selected countries, career maps following a respective four-stage model, which focuses specifically on academic careers, are provided by LERU⁹. Country correspondents were made aware of these existing descriptions and they provided with the respective links allowing them to access the relevant information.

In the following chapter the information and data from the country specific case studies will be presented. We will start with a descriptive overview regarding important issues tackled in the country correspondents’ template complemented by some statistical data. This will be followed by the statistical analysis of the data provided. The individual country fiches which were provided by the country correspondents can be found in the annex.

3.1 Methodological approach

Our comparative analysis of academic careers is based on ideas developed by Kaulisch and Salerno (2009) which have been further developed and elaborated

⁹ <http://www.leru.org/index.php/public/extra/careermapseurope/>

throughout the course of the MORE2 project. In our analysis we tried to deploy a more holistic approach for evaluating different overlapping contexts in which academics' careers unfold and to provide a better – comparative - understanding of how the sequence, timing and likelihood of major events in academic careers develop.

In our analysis we are broadening the focus of academic careers beyond the usual perspective on organizational aspects (e.g., moving up the hierarchical ladder) or employment conditions (e.g., permanent vs. temporary employment) of careers. Relevant research fields, particularly in life course research and career research, commonly use respective approaches when investigating careers (e.g., Hall, 2002; Steyrer, Mayrhofer, & Meyer, 2005; Mayer 2004).

3.1.1 Institutional context of academic careers

Academic careers are particularly shaped by three overlapping contexts: 1) scientific, 2) societal, and 3) higher educational (Enders, 1996; Gläser, 2001; Kaulisch & Enders, 2005).

In many ways, each context possesses a "logic" that not only creates overlap but in some cases, conflicting behavior or expectations. Together, these overlapping contexts create specific conditions that invariably shape academics' working conditions, work roles, career stages and expectations. Gläser (2001) suggests that, "career problem's complexity is caused by the fact that scientists act simultaneously in several social contexts" (Gläser, 2001, p. 700).

The science context is dominated by knowledge production and its measurement as a performance yardstick. The gradual differentiation of knowledge into disciplines and sub-disciplines over the past 200 years has laid the framework for the source of today's knowledge acquisition structure. It is in this domain that scientists formulate research problems, ply their discipline's paradigms and test hypotheses. Not surprisingly, the academic's devotion to accumulating knowledge in a narrow area of expertise over a long period of time, the acquisition of prestige through peer review and the relatively flat organizational structure of the contemporary higher education institution have all worked to bind academics more to their area of study than to their institution (Alpert, 1985). Importantly, the main rewards academics receive are usually bestowed through the science system and guided by borderless evaluation from one's peers.

The societal context captures, "the institutionalized patterns of life course...included in a system of social stratification" (Gläser, 2001, p. 704). Systems of education, certification, employment and social security fall under this heading and shape academic work roles and careers in specific ways. National labor markets set specific conditions on earnings, employment regulations and positions available outside academe. This context also defines the extent to which organizations are responsible for both funding and the arrangements behind teaching and research activities.¹⁰

The higher education context includes those institutions governing academic careers through the rules on tasks and qualification requirements, work roles, working conditions, staff structures and career ladders. Colleges and universities' formal frameworks also shape intra- and inter-organizational mobility, mediate resource flows and influence academics' expectations about their contributions and performance. In essence, the institution as employer provides a parameterized

¹⁰ Universities' autonomy in generating and spending funds depends on the governance pattern between state and universities. In similar respects, state-regulations enable and restrict universities in their autonomy to design study courses as well as to decide on the extent of academics' tasks in research and teaching.

environment for scattered professionals to coordinate for the institution's greater benefit. On a more pragmatic level, this context is defined by specific degrees of freedom allotted to different individuals, the establishment of working conditions, and the design of internal staff structures and promotion ladders.

Clearly these three contexts overlap in myriad ways. The formal and informal rules in the science context influence and are influenced by the contextual nature of the specific types of institution one works in. Higher education institutions' regulations are shaped by societal rules. Resource allocations are defined, in part, by the confluence of all three. What is not so clear, though, is that the overlap between the contexts sometimes can also produce conflicting expectations and conflicts. Faculty members, for example, are expected to teach and undertake research and their performance is judged, at least in part, on how they do at both. At the same time while efforts towards teaching are beneficial in the higher education context, the time spent is detrimental in the science context.

3.1.2 Five sets of rules influencing sequence, timing and likelihood of major career events

Academics' career paths are guided by the formal and informal rules that emerge from these three institutional contexts. By themselves each of the three is overly broad and this makes it difficult to precisely characterize the sequence, timing and likelihood of major career events: a critical aspect for comparing and contrasting different countries' "academic career systems." Sequence and timing capture the inter-temporal nature of careers as an "evolving sequence of a person's work experiences over time" (Arthur, Hall, & Lawrence, 1989, p. 8), while incorporating the likelihood of major career events provides useful markers for describing academics' motivations, career aspirations and opportunities to reach particular goals.¹¹

If career systems are treated as "collections of policies, priorities and actions the organization uses to manage the flow of their members into, through and out of the organization over time" (Sonnenfeld & Peiperl, 1988, p. 588), then careers can be examined according to the organizational practices that deal with employees' entry, development and exit. Focusing on national career systems is important because academic careers and labor markets are heavily influenced by national regulations and traditions rooted in the history and organization of higher education systems. In national systems, inter-organizational relationships play an important role in determining the likelihood of major career events.¹² Selecting, hiring and promoting academic staff depends not only on the criteria established by one's discipline but is also shaped by the timing of academic careers. When an individual completes a degree and where they do it (credentialing) influences future career opportunities (Burris, 2004; Caplow & McGee, [1958] 2001; Miller, Glick, & Cardinal, 2005).

The discussion, to this point, has identified numerous factors shaping academics' careers and career options. In an effort to systematize this wealth of information and use it for constructing an analysis, we focus on the common denominator shared by all: formal and informal rules.

More specifically, we collapse these rules into five basic sets that arguably capture the different contextual patterns and overlapping dynamics identified above:

¹¹ Sørensen (1992), for example, argues that these are important because of their influence on academics' productivity and relationship to the science system.

¹² The influence of inter-organizational prestige hierarchies is described later. One is more likely to get a position at a good university if they have a degree from a prestigious university.

1) academics' employment, 2) credentials, 3) intra-organizational¹³ practices, 4) inter-organizational relationships and 5) academic disciplines. We briefly lay out these five basic sets in the following sections. The variables used to reflect these five sets will be introduced at a later stage. The tables used to describe the variables and how we utilized them are organized in these five categories.

3.1.2.1 Academics' employment

Employment rules address the basic timing and sequence of academics' careers. They include and involve rules related to staff structures and career ladders as well as positional rewards and organizational hierarchies, four concepts that are strongly interrelated. Staff structures heavily influence staffing procedures and lay the foundation for power hierarchies between different levels within universities; one can think, for example, of the different administration, faculty and department relationships in top-down or bottom-up organizations.

Neave and Rhoades (1987) distinguish between two academic staff structures: the chair- and department-models. Chair-models are mainly found in Continental Europe and departmental-models are more representative of places like the United Kingdom and United States. The former is characterized by a high concentration of power and authority in the hands of individual professors who manage the administrative and scientific work of their institute, allocate resources and often negotiate directly with state ministries. Chairs have the power to decide who will be employed in their institute as well as their subordinates' degrees of scientific freedom. In contrast, the department-model focuses more on inter-rank collegiality. Although the British higher education system maintains chair positions, its power is notably diluted in comparison to places like France or Germany. And while, in the departmental model, non-professorial staff are far from equal to full professors they are less dependent than their Continental European counterparts and more actively involved in departmental decision-making.

These staff structure types influence career ladders to the extent that they create different degrees of "steepness" at various points in an academic career (Sørensen 1992). The promotion from a non-professorial to a professorial position is a much greater step in the chair- rather than departmental-system. In this sense the American and British higher education systems have more recognizable career ladders, in sense of career progressions within an organization, than the chair-models in Germany and France, where career progression is based more on credentials, state control or chairholders' goodwill. Higher education systems with a departmental-model of staff structure tend to stress organizational careers and, thereby, securing permanent positions (which tend to occur relatively early in an academic career) based on organizational decisions.

3.1.2.2 Credentials

The second set of rules relate to credentials awarded. Similar to other professions, specific qualifications and certificates are required to obtain an academic position or advance to a higher career stage. Academic career systems vary in their use and design of credentials. In general, credentials are primarily used to evaluate job candidates' suitability and potential future performance (Sørensen, 1992).

Entry into academia as a researcher usually requires some form of post-graduate training; typically a doctoral degree is needed. Even in countries where researchers without a doctoral degree can obtain permanent positions (such as was tradi-

¹³ In this theoretical framework, we use the term 'organization' to distinguish it from the theoretical term 'institution' and to emphasize the organizational nature of the topics at hand. Later in the empirical part, higher education institutions (HEI) are used as a technical and widely used term. The term 'institutions', in this sense, describe higher education organizations.

tionally the case in the Netherlands or the United Kingdom) chances for promotion are severely limited without it. In some countries and certain academic fields, post-doctoral credentials may also be needed. Sometimes a second post-graduate degree is also needed to advance to the highest available academic positions.

3.1.2.3 Intra-organizational practices

The third set of rules reflects organizations' hiring and promotion practices. The freedom or flexibility to hire staff is an important facet with regard to the functioning of the internal labor market. The extent to which different institutions and systems possess such flexibility differs by country. In the UK and the US for instance, universities have considerable autonomy over such matters while in other countries the decision is remanded to the state.¹⁴ If the universities have control over the selection process then internal governance plays a much greater role by balancing administrators' and academics' power to select and promote staff and selection procedures become a relatively unique process in each university and department.

3.1.2.4 Inter-organizational relationships

The fourth set of rules deals with inter-organizational relationships. In particular, in this set of rules, two main points stand out: the prestige hierarchies between universities and the openness of systems to inter-organizational and intersectoral job mobility.

The first point refers to the extent to which prestige hierarchies influence academics' career decisions. In some countries there are very steep institutional hierarchies and where an individual completes his / her doctorate strongly influences future job opportunities.¹⁵ In other countries such a steep hierarchy does not exist; and in principle all universities are considered equal. Here, prestige is attached more to the individual than to the university. According to Neave and Rhoades (1987), this equality among universities is due to states' involvement because the state promotes universal criteria on assessments of universities, quality of study courses and funding.

Countries also differ in the number of formal and informal job changes faculty members make between universities. For the sake of scientific development, academics' job mobility is mostly appreciated because it forms a type of cognitive career (Gläser, 2001) by which academics exchange their knowledge with colleagues at different places, leading to new scientific ideas. In some countries, regulations prohibit internal - meaning within the same organization - promotion to a professorial position whereas in others internal progression or promotion may be the only route to a permanent position. Thus, job mobility is influenced by the mixture of permanent and temporary employment in the system. Where a large proportion of permanent positions exist, inter-organizational job mobility is assumed to be relatively low; the converse of course is that greater job mobility is associated with greater use of non-tenured employment.

Both approaches have positive and negative effects. Temporary employment allows universities to more frequently select suitable candidates and more easily respond to changing funding conditions. On the other hand, universities may lose

¹⁴ This is not always the case. In chair-systems professors often select candidates for non-professorial positions without a formal procedure and even in formal procedures professors' protégés have a high chance of obtaining the job. State supervision can have a direct influence on whom a university appoints, the ranking of candidates or the funding of the position.

¹⁵ As Caplow and McGee ([1958] 2001) have shown, the prestige of a supervisor and the prestige of journals in which candidates have published heavily influence the decision-making process about candidates.

both prestige and capacity if academics leave for another university or to other employment sectors. Furthermore, continuous employment insecurity may act as a disincentive and increase academics' efforts to search for more secure positions instead of concentrating on the current position (House of Commons. Science and Technology Committee, 2002).

Additionally, nowadays the intersectoral mobility of researchers is considered to be as significant for research developments both in and outside of the higher education sector, as are academics' job mobility inside the higher education system.

3.1.2.5 Academic disciplines

The last set of rules relates to those facets unique to the various academic disciplines. Disciplines vary with regard to the implicit and explicit criteria for organizing, judging and rewarding academic work they undertake. Communication in some fields is primarily driven by conference presentations while in others refereed journals are the norm. In the humanities, where books are considered the typical research output, per-year productivity expectations are much lower than in journal-oriented fields. Also the organization of knowledge production differs. Much of the research done in the physical and biological sciences tends to be conducted in large, multi-institution teams, contrasted with the stereotypical lonely historian. Clearly, such structures influence the organization of academic units, faculty members' relationships with their colleagues and a host of other factors.

These five sets of factors have been addressed in the country templates used for collecting the data at country level (see IDEA Consult et al (2013a) for the country template used for data collection, the country specific case studies provided the raw data). As outlined in chapter 2 individual country fiches were assembled by an extensive network of country correspondents. This data formed the basis for further analyses. From these fiches we retrieved the information to be operationalized as variables for further analyses (see section 3.1.3). In section 3.1.4 the analytical approaches and the variables used for comparative analyses will be described.

3.1.3 Data collection and coding

Our analyses are based on the data provided by 47 country correspondents who answered the country correspondents' template (details about the data collection and for the country correspondents' template see chapter 2 and the technical report for WP3 and WP 4, IDEA Consult et al (2013a)).

After the country correspondents filled in the templates, the data was transmitted in an Excel-file and one Word-file per country.

While the Excel-file builds the base for data management, the Word-files were essential as the basis for the further analysis. They contained all answers to the questions asked and formed the basis for transferring the information into variables as open-ended questions that had to be coded. The coding of all open-ended questions was done with the help of MaxQDA¹⁶ software. The data coded in MaxQDA was afterwards imported into Stata¹⁷, the statistical package we used for managing the data for performing the statistical analyses. Most of the information was provided in a rather unstructured way and thus, extensive efforts were put into data cleaning and coding of variables. Furthermore, if necessary, and as part of the quality assurance process, country correspondents were contacted after

¹⁶ We used MaxQDA version 10 from Udo Kuckartz with the release date of 25th April 2012.

¹⁷ We used Stata version 12.1 from StataCorp at each stage of analysis with the latest available version.

they delivered their completed templates and they were asked for some clarification or additional data, which led to last minute changes with regard to the answers provided and information given requiring adjusting also the data to be used for further analyses (e.g., Spain changed the assignment of a position from R4 to R3 after being asked for some clarification).

3.1.4 Strategy for analyses

The goal of our analysis is to identify groups of countries with similar academic career systems, focusing on the employment conditions and career paths of early career researchers.

We approached this goal using a two-step process: In the first step, we focused on each of the four careers stages introduced by the European Framework for Research Careers (European Commission 2011, p. 2). The European Framework for Research Careers describes the career stages at a universal unifying level. Our intention in this first analytical step is to identify how far the career stages are coherent among countries in terms of employment and working conditions. We furthermore try to generate major dividing lines between the countries observed.

In a second step, we compared the career systems as such and identify groups of countries where these systems are characterized by similar features. In this step, the theoretical framework introduced in section 3.1.2 has been applied.

In both steps, we used the same methods to generate a country classification. We applied a sequence analysis that calculates the (dis-)similarity between countries. A cluster analysis was then used to identify groups of similar countries. The sequence analysis is used to determine the (dis-)similarity of country because we intend to group a limited number of countries with a rather large set of variables¹⁸. The advantage of the sequence analysis is its handling of missing values¹⁹. Furthermore sequence analysis treats different values in a variable as equally different²⁰. In the sequence analysis, each country is represented by a sequence of values for the variables used (see sections 3.1.4.1 and 3.1.4.2).

Sequences may look like the following constructed examples:

Country	Sequences constructed based on the values of variables
	age range, type of contract, research and teaching nexus, level of researchers' autonomy, type of funding, tenure-track option
A	1 1 1 8 1 1
B	0 1 1 2 1 0
C	1 0 1 4 0 1

¹⁸ In the country classification of career systems 27 variables are used to group 47 countries.

¹⁹ In cluster analysis cases with missing values are excluded from analysis whereas in sequence analysis a value given for missing value is treated as similarly differentiating two countries as if they had two different codes in this item.

²⁰ In cluster analysis, values that are closer to each other such as 0 and 1 compared to 0 and 3 are more commonly grouped together. But in our analysis we deal with nominal data where the meaning of the difference between value 0 and 1 is equal to the difference between values 0 and 3.

3.1.4.1 Country classification with regard to each career stage

For the country classification based on the different career stages, the selection of variables is oriented along the criteria which have an influence on the sequence, timing and likelihood of academic careers. We use the following set of variables to characterize the career stages and to identify their coherence. For each career stage we focused on:

- the age range at which positions are obtained,
- the typical type of contract awarded,
- the task division between research and teaching,
- the level of researchers' autonomy,
- the type of funding typically associated with positions at the stage and
- whether tenure-track options are available at this career stage.

The variables used are described in more detailed in Table 3.1.1. Table 3.1.2 to Table 3.1.6 provide an overview of the variables used for the comparison of countries with regard to the overall career systems. The tables are organized by the five sets of rules outlined in section 3.1.2. The tables contain the following information: internal Topic ID, a short description of the topic, the question(s) from the country correspondents templates used as basis to operationalize the variable, the potential values of the variable and a description how the operationalization of the variable has been implemented including comments on data quality.

Table 3.1.1: Variables used to generate country classifications for each career stage

Topic ID	Topic	Question	Values	Operationalization
1.1	Age obtaining the career stage	C05d	Age ranges: -30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-	<p>The type of contract is well coded (Question C05e) but the data on age per position (C05d) was difficult to handle because an exact date or even date range is rarely given. We coded it very carefully. If an age range given by a country correspondent stretching across two age ranges category, then the younger age range was chosen.</p> <p>If two or more unique positions per career stage were provided, then age categories of all positions in a career stage were averaged and then again categorized into age ranges. The variable values representing the age ranges are used for this calculation (e.g. age range -30 is coded as 1; 31-35 is coded as 2). If the average values is decimal then the cut point x.5. E.g., if two positions in R1 are categorized in age ranges 1 and 2, then the average is 1.5. As the cut point is set at .5 the resulting category is 2 (31-35 years of age).</p> <p>In addition, we used the information about the age at first tenured position (question C.0.9) and the age at first professorial position (question C.0.10) to fill out missing information on R4 (professorial positions) and R3 position. In the latter case only if a R3-position was indicated as one with permanent contracts.</p>
1.2	Type of contract	C05e	Only positions with permanent contracts positions both with temporary and permanent contracts only positions with temporary contracts	<p>The type of contract is well coded (Question C05e).</p> <p>The basic values are averaged over all positions in a career stage. If mean is neither temporary only (value 0) or permanent only (value 1), then a third category "positions both with temporary and permanent positions" is chosen.</p>
1.3	Research and teaching nexus: are positions in this career stage predominantly involved in research or teaching	C05k	Research-oriented Teaching-oriented Research-and-teaching-oriented Research-or-teaching-oriented	<p>In general, it was difficult to recode answers in a meaningful way because correspondents' answers are by no means really clear cut. And it seems that even within positions a wide range of task divisions are enforced.</p> <p>We calculated the number of positions per career stage as being research-oriented, teaching-oriented or research-and-teaching-oriented. Only if more than half of the positions are with a certain category, this category is taken for the career stage. If no category has a majority and one position was coded as research-and-teaching-oriented, then this category was chosen. If only teaching- or research-only positions are named, then a fourth category was taken: research-or-teaching-oriented.</p>

Topic ID	Topic	Question	Values	Operationalization
1.4	Level of researchers' autonomy	C05l Four items: academic, financial, organizational and staffing decisions	Low level of autonomy Middle level of autonomy High level of autonomy	Level of autonomy is judged on a five-point-scale ranging from very low (1) to very high (5). Answers indicating no autonomy or not applicable are coded as very low. Per position an averaged value is calculated over the four items used to identify researchers' autonomy. This average value per position is again averaged over all positions per career stage. Finally, the average value per career stage is categorized: if average is up to 2.5 it is considered as low level of autonomy, average between 2.51 and 3.5 is considered as middle level of autonomy and a value between 3.51 and 5 is considered as high level of autonomy
1.5	Majority of researchers are funded by block funding?	C05m	Basic/block funding Competitive funding Basic/block funding and competitive funding Basic/block funding or competitive funding	Calculated the number of positions per career stage with either basic/block funding, competitive funding, basic/block-funding-and-competitive-funding. Only if more than half of the positions are with a certain category, this category is taken for the career stage. If no category has a majority and one position was coded as basic/block-funding-and-competitive-funding, then this category was chosen. If only basic/block- and competitive funding are named, then a fourth category was taken: basic/block-funding-or-competitive-funding.
1.6	Tenure-track option available	C05g	Yes, tenure-track option is available No, tenure-track option is not available	Summed up all values over positions in career stage (tenure-track option is coded as value 1). If the sum of all positions in a career stage is 1 or greater then Yes, tenure is possible within career stage. If sum is 0 no tenure-track option in career stage available.

3.1.4.2 Country classification of academic career systems

For the country classification of academic career systems, we used the five sets of rules guiding us in selecting and grouping the variables. Our methodology is the same as that used for the country classification for each career stage. The tables presented in the following sections are structured the same as Table 3.1.1. The descriptive statistics of these variables are presented in Appendix 7.2.

Academics' employment

The variables representing rules on academics' employment (see Table 3.1.) reflect eight categories: staff structure, autonomy of researchers, employment security, performance-orientation in career advancement, selection procedures, importance of international mobility, financial rewards to climb the career ladder and general social security levels.

Credentials

Three variables are selected to represent the system of credentials in a country (see Table 3.1.3): The extent to which doctoral education is structured, the necessity of a second post-graduate research degree such as the Habilitation and the variety of institutions which are allowed to award doctorates.

Intra-organizational practices

Four variables are selected to denote the intra-organizational practices in a country (see Table 3.1.4): Site where positions are mainly advertised the source of funding of R3 positions, the level of HEI autonomy and the organization of selection.

Inter-organizational relationships

Five variables are selected to characterize the inter-organizational relationships in a country (see Table 3.1.5): Degree of sectoral differentiation, intersectoral mobility as prerequisite to pursue specific career paths, vertical differentiation of HE system, attractiveness of positions outside academe for young researchers and autonomy of universities to set employment conditions.

Academic disciplines

The strength of discipline-specific conditions is used to map the influence of disciplines shaping academics' careers (see Table 3.1.6).

Table 3.1.2: Academics' employment. Variables used to generate country classifications

Topic ID	Topic	Derived from question	Categories	Operationalization
2.1	Vertical differentiation within staff structured	B04	chair model department model no answer/missing	Straight forward coding into these two categories.
2.2	R1+R2 are the majority of researchers	C07	Yes No No answer/missing	Difficult coding process due to lack of data and/or calculations used from administrative data that does not necessarily reflect the R1-R4 typology. Additionally it is not always clear whether doctoral students are always counted as R1-researchers. Total percentage of researchers per country by summing up the values for R1+R2 und R3+R4. If sum of R1+R2 is higher than half of the total it is coded as 1 and if the sum of R3+R4 is higher than the half of the total it is coded as 0.
2.3	Career stage at which own research agenda can be pursued	C011a	R1, R2, R3, R4	If more than one career stage is reported, then lowest possible career stage is taken where high levels of autonomy can be assumed. Any indications that a career stage does not give full rights in setting own research agenda, the higher career stage with full rights is taken. (e.g., Germany (R3)/R4 will be coded into R4 because R3 has no full rights indicated by parentheses).
2.4	Length of contracts: Contracts in R1+R2 position are shorter than 2 years	D05 E05	Yes, no	In most cases the coding was given by the answers of the country experts. The other answers were coded. Temporary contracts with a pre-set evaluation date by which a contract will be prolonged (or not), it is coded as the period until the evaluation date. E.g. An answer suggesting 3+3 contracts are coded as 2-4 years period.
2.5	Age of first permanent position	C05d C05e	Age ranges: -30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-	See Topic ID 1.1 (in Table 3.1.1) for a general comment on coding age ranges. For this topic, the age range of the position with the youngest age and a permanent position was chosen.
2.6	Stage at which permanent position can be obtained	C05e	R1, R2, R3, R4	The lowest career stage providing a position with a permanent position was chosen.

Topic ID	Topic	Derived from question	Categories	Operationalization
2.7	Importance of performance in career advancement	C05c	No strong performance orientation Some performance-orientation Performance-oriented categories are equally distributed among positions	The performance-orientation per position is given when performance criteria are named as "major" or even "only" criteria, the mixed value is taken when performance criteria are described as equally important as non-performance-based criteria. The absence or weak presence of performance criteria with regard to a position are coded as no strong performance orientation. The position-based coding was transferred into the country-wide categorization by counting the number of occurrences per category in a country and chosen the country-characterizing category when it occurs in at least half or more of all positions. If none of the categories accounted for more than 50 per cent of all positions, then the category "categories are equally distributed among positions" is chosen.
2.8	Transparent selection criteria	C04	Criteria for selection criteria to R4 positions provided by law / other state regulations (1) Criteria for selection criteria to R4 positions NOT provided by law / other state regulations (0)	Coding of the variable (question C04) was difficult, because not all answers cover all aspects of the question. Thus, we decided to use the criteria whether state regulations or law provide rules on selection criteria.
2.10	International mobility a prerequisite of an academic career	C013b	Yes (2) In some cases (1) No (0)	We coded "yes" if the country correspondent stated that international mobility is a prerequisite or strong enhancer for R3 or R4 positions which might also occur at the post-doctoral level. In some cases correspondents stated that international mobility is only important for certain disciplines or subgroups of academics. Then it is coded as "in some cases".
2.11	Schemes to enhance international mobility	C013	National initiatives that go beyond standard European initiatives (1) Only European initiatives mentioned/or none (for non-European countries) (0)	We basically distinguish between countries that do have national schemes to enhance international mobility and do not only rely on European initiatives only.
2.13	Financial reward against R3 position	of R4 D02 E02_can	Up to 20% 21-40% 41-200%	A detailed report on the construction of the three financial reward topics is given in section 3.1.4.3.
2.14	Financial reward against R2 position	of R3 D02 E02_can	Up to 20% 21-40% 41-200%	
2.15	Financial reward against R1 position	of R4 D02 E02_can	Up to 100% 101-200% 201% and more	

Topic ID	Topic	Derived from question	Categories	Operationalization
2.16	Social security level	D04 E04_can E04_hold	Low Middle High	The questions D04 and E04 provide information whether a position includes health care insurance, unemployment insurance and retirement insurance. We totaled the number of items per country and divided it by the number of positions per country. The average social security items per position were then categorized into three levels of social security: low up to an average of 1.75 items; middle between 1.76 and 2.75 items; high between 2.76 and 3 items.

Table 3.1.3: Credentials. Variables used to generate country classifications

Topic ID	Topic	Question	Values	Operationalization
3.1	Doctoral education	C02	Yes/Yes Yes/No No/Yes No/No	Straight forward coding based on entries from the templates.
3.2	Second degree needed	C03	Yes No but tradition No	Straight forward coding based on entries from the templates.
3.3	Who awards doctorates?	B01 3	Universities university plus others	Straight forward coding based on entries from the templates.

Table 3.1.4: Intra-organizational governance. Variables used to generate country classifications

Topic ID	Topic	Question	Values	Operationalization
4.1	Site where positions are mainly advertised	C04	International National Institutional	In principle, this information was provided by country correspondents effectively. But as advertisements of positions also depend on the position and the career stage affected, the coding needed some judgment calls. We decided that the next higher value (international/national) is taken if it is mentioned to be a common practice even if not all positions are advertised internationally or nationally.

Topic ID	Topic	Question	Values	Operationalization
4.2	Source of funding of R3 positions	C05m	Basic/block funding Competitive funding Basic/block funding and competitive funding Basic/block funding or competitive funding	For the coding of this item please see Topic ID 1.5 in Table 3.1.1.
4.3	Level of HEI autonomy	B03_aca B03_fin B03_org B03_sta	High Middle Low	The average score (Scale 1 very low to 5 very high) of these four items in Question B03 was calculated. The outcome was categorized into three levels of autonomy: low if the average score was below 2.75; middle is the average score was between 2.76 and 3.75; high if the average score was above 3.76.
4.4	Organization of selection	C04	Country-wide competitions Institution-based competitions	Similar to the other items derived from question C04, it was difficult to construct a meaningful variable about the organization of selection because the information varied widely between countries. The best possible way was to see whether selection was organized on a country level or is done within the institution.

Table 3.1.5: Inter-organizational relationships. Variables used to generate country classifications

Topic ID	Topic	Question	Values	Operationalization
5.1	Degree of sectoral differentiation		R&D performed by business sector R&D performed by business and HE sectors R&D performed by business and government sectors R&D dominated by business sector but other sector are also relevant R&D performed by all sectors on a relevant scale	The data used to calculate the sectoral differentiation was taken from Eurostat and OECD data on percentage of GERD performed by a sector (see section 3.2.1). We concentrated our analysis on percentage of GERD from higher education, business and government sector because the private non-profit sector is very small in nearly all countries (exceptions are: Portugal and Cyprus). Rules to categorize countries are: <ul style="list-style-type: none"> • Percentage of GERD in business sector above 66% and in both higher education and government sector below 20%: R&D performed by business sector • Combined percentage of GERD in business and higher education sector above 80% and percentage of higher education sector above 20%: R&D performed by business and HE sectors • Combined percentage of GERD in business and government sector above 80% and percentage of government sector above 20%: R&D performed by business and government sectors • Percentage of GERD in business above 50% and both higher education and government sectors above 14%: R&D dominated by business sector but other sector are also relevant • All sectors perform more than 20% of the GERD: R&D performed by all sectors on a relevant scale
5.2	Inter-sectoral mobility as prerequisite to pursue specific career paths	C012 d+e	Yes No Cannot be typified	In general, intersectoral mobility is not a prerequisite to perform an academic career. But in some tracks of the academic career intersectoral mobility is a prerequisite. If those special cases were provided in question C012d+e, then "Yes, intersectoral mobility is a prerequisite" was coded.
5.3	Vertical differentiation of HE system	B01 2 c+d	Teaching-only type of HEI No teaching-only type of HEI	Straight forward coding based on entries from the templates.

Topic ID	Topic	Question	Values	Operationalization
5.4	Attractiveness of positions outside academia for young researchers	C015	Higher education sector is: less attractive similarly attractive more attractive	<p>We calculated the average score of higher education sector and the average scores of all other sectors in question C015 that is coded on a scale 1 (very poor) to 5 (excellent). Do not know and sector not relevant are treated as missing values. The difference between the scores for higher education and the other sectors are then used to categorize the countries into:</p> <p>less attractive if the difference is minus 0.41 to minus 4 similarly attractive if the difference is minus 0.4 to plus 0.4 more attractive if the difference is plus 0.41 to plus 4</p>
5.5	Autonomy of universities to set employment conditions	B03_org B03_sta F01 H01		<p>Variables from all three basic questions (B03, F01, H01) that do indicate whether HEI have autonomy to set employment conditions are taken. For each basic question a categorization into low, middle and high autonomy is performed. Then, the sum of all three variables is taken to finally categorize the variable into low, middle and high level of autonomy.</p> <p>The operationalization of the B03 criteria is described above in Topic ID 4.3 (see Table 3.1.4).</p> <p>Question F01: All items are counted that were ticked to be an issue of individual or institutional negotiations. If four or more items apply high autonomy is coded. If one to three items apply middle autonomy is coded. If no item applies, low autonomy is coded.</p> <p>Question H01: If the provision of health care and retirement funds depends on university then high level of autonomy is coded. If the provision of health care or retirement funds depends on university then middle level of autonomy is coded. If both do not apply on university level, then low level of autonomy is coded.</p> <p>If a country scores fully in two of the three questions, then high level of autonomy is coded. If a country scores in all variables on a middle level or in one high and in another a middle level, then middle level of autonomy is coded. If a country scores only in two of the three variables in a middle level and in the other low (or it scores even less), then a low level of autonomy is coded.</p>

Table 3.1.6: Academic disciplines. Variables used to generate country classifications

Topic ID	Topic	Question	Values	Operationalization
6.1	Strength of discipline-specific conditions	C05n	yes, disciplines vary strongly in their conditions no disciplines most researchers experience the same conditions	Straight forward coding based on entries from the templates.

3.1.4.3 Excursus: Construction of financial reward variables

(Topic IDs 2.13 – 2.15 in Table 3.1.)

We used the following steps to generate income data and to categorize the financial rewards delivered with regard to career progression within a country:

1. D.0.2 (referring to question D.0.2 in the country correspondents' template) income data per position is taken as base.
 - a. For R1-grant holder positions, E.0.2 data (doctoral candidate stipends, question E.0.2 in the country correspondents' template) is used.
2. Types of income data were not provided by country correspondents from all countries. Some provided only minimum and maximum per positions, others only the average and so forth. In this step, we identified the type of income data that is available for all career stages.
 - a. If all types of income are available, average data on income per position is taken. If not average but minimum income data was provided, than minimum income data is used. If only maximum income data was provided on all positions, then this is taken as the last possible option.
 - b. The following calculations are based on the type of income chosen for a country.
3. The minimum, average and maximum of the chosen type of income over all positions **within a career stage** is calculated.
4. The **income differentials between ranks** are calculated for the minimum, average and maximum income of all positions within a career stage.
 - a. The differentials are calculated as follows:
 - i. Example: average differential between R4 and R3 career stage:

$$((inc_mean_R4/inc_mean_R3)*100)-100$$
5. The resulting income differential is calculated as the **average of these minimum, average and maximum differentials between ranks**.
6. The averaged differentials are then classified into three categories.

The differentials are categorized as follows:

The income differentials between two ranks (R3 to R4 and R2 to R3) get the same categories: Up to 20%; 21-40%; 41-200%

As the span between R1 and R4 is wider, the income differentials are as well. So we identified the following categories: Up to 100%, 101-200%, 201% and more

3.2 Country comparison – the R&D system

The Innovation Competitiveness Report (European Commission 2011a) provides rich and illustrative data and analysis comparing the performance and competitiveness of the European Union and its member states against its global competitors. Furthermore, the Innovation Union Scoreboard regularly provides benchmarking information on EU member states and their competitors. These reports provide a wide range of data and indicators reflecting the overall set up and performance of national systems of innovation and thus also provide an extensive insight into the general framework conditions under which researchers can pursue their careers.

In this section we provide a more focused overview using a small set of indicators to provide an insight into general working conditions. We focus on the most relevant sectors where research careers can be pursued in the countries under inves-

tigation; the financial resources available to undertake research in these sectors and the human resources, specifically the researchers engaged in performing research in these sectors. Data is provided – depending on availability – for the countries under investigation, which also highlighting the structural diversity among these countries and thus the variances when it comes to the conditions under which research careers can be pursued. The statistical data presented here was also provided to the country correspondents as input for their work when compiling their country cases. After a discussion of selected indicators retrieved from EUROSTAT and OECD statistics, data from the country templates will be presented comparatively. In this section, comparisons are mainly descriptive.

3.2.1 The countries' R&D intensity, sectors of R&D performance and human resources in research

R&D intensity in the EU increased over the last years (European Commission 2011a, p. 20) but, in most member states the 3%-target set in 2005 has not yet been reached. Consequently the average value for the EU 27 also remains below this target (see Figure 3.2.1). As outlined in the Innovation Union Competitiveness report, R&D intensity grew significantly stronger in the Asian countries, Japan, South Korea and China (European Commission 2011a, p. 21). With regard to R&D intensity Japan and South Korea are among the leading countries, also China is closing the gap to the EU 27 average. Particularly low is the R&D intensity in most south and eastern European countries.

In the context of the EU 2020 strategy, in 2010, most countries renewed the targets to be achieved, retaining the 3% mark for the EU as a whole, but with significant differences when it comes to the individual countries. Some competitors, e.g. South Korea (5%) and Japan (4%), are aiming for higher R&D intensities in the same period; China is aiming for the 2.5% mark. The US, like Europe, is aiming for an R&D intensity of 3%²¹.

Apart from the differences with regard to the R&D intensity as such, we also observe rather large structural difference among the EU member states – referring to the relevance of the sectors in which research is actually performed (see Figure 3.2.2 to Figure 3.2.4).

The relevance of the different sectors as research performers varies between countries. In a large number of EU countries the higher education sector is – in terms of the share of GERD performed by the sector – relatively more important than in China, Russia, South Korea, Japan and the United States. In China and Russia only approximately 8%, in South Korea 11% and in Japan and the US approximately 13% of GERD are undertaken in the Higher Education Sector; in Cyprus, Greece and Lithuania – on the other hand – this share amounts to approximately 50%. On average, in the EU 27 24% of GERD are undertaken in the Higher Education Sector (Data: Eurostat and OECD). More generally, in a number of EU countries, research is performed to a higher extent in the public sector, particularly in the southern and eastern European countries, than in the United States, South Korea, China, and Japan.

²¹ http://ec.europa.eu/europe2020/pdf/themes/12_research__development.pdf

Figure 3.2.1: GERD as Percentage of GDP – Total (2010 or latest year available)

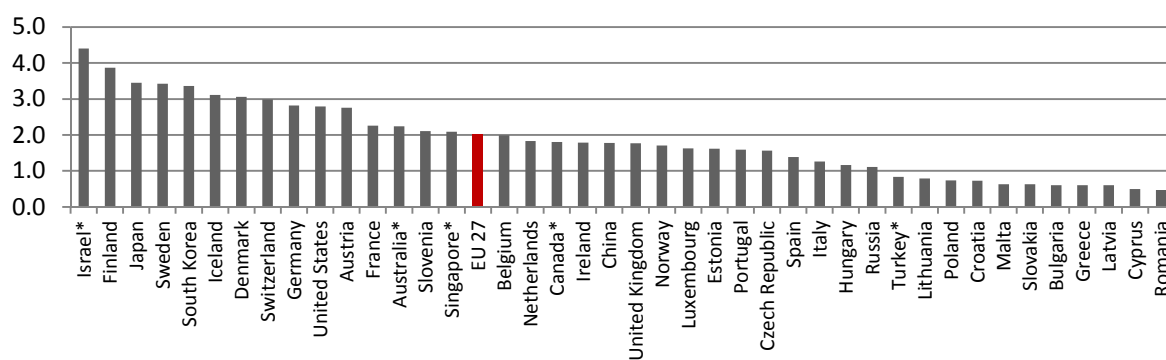


Figure 3.2.2: GERD as Percentage of GDP by Sector of Performance – Higher Education Sector (2010 or latest year available)

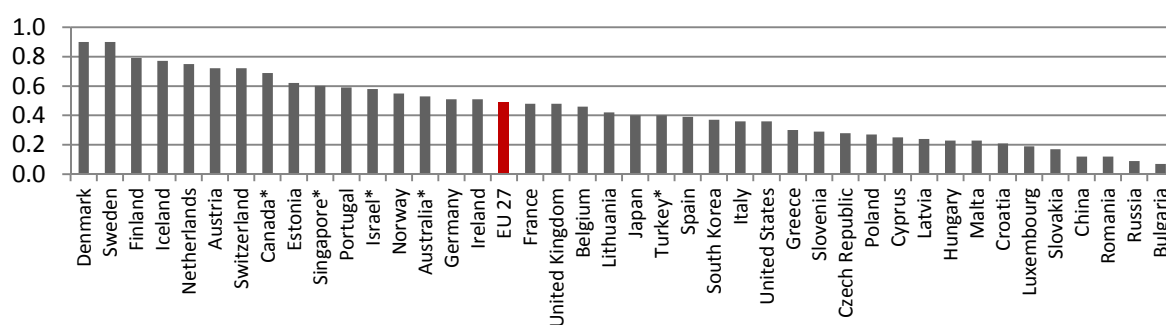


Figure 3.2.3: GERD as Percentage of GDP by Sector of Performance – Government Sector (2010 or latest year available)

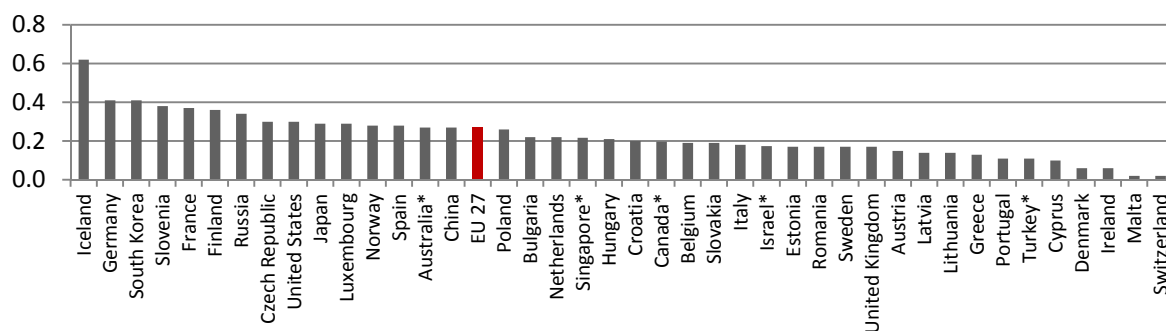
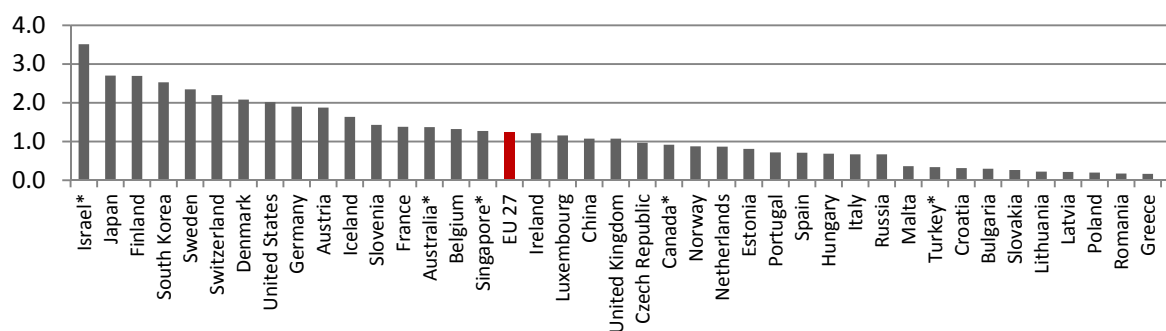


Figure 3.2.4: GERD as Percentage of GDP by Sector of Performance – Business Enterprise Sector (2010 or latest year available)



Data for Figure 3.2.1 to Figure 3.2.4: Eurostat. Countries with * OECD

More than 1.5 million researchers are employed in the EU (see Table 3.2.1). Only China employs more researchers. In line with what has been said about the relevance of the sectors performing R&D from a financial view point, the significance lies in the distribution of researchers working in these sectors. Thus, the share of researchers employed in the public sector in EU countries is comparatively high. However, differences exist among various countries. Particularly high is the share of researchers employed in the public sector in Slovakia, Bulgaria, Lithuania, Latvia, Croatia, and Poland. In these countries more than 80% of the researchers are employed in the public sector. In Romania, Cyprus, Greece, Portugal and Estonia this share still exceeds two thirds of the researchers. By way of contrast, this is the situation found in the competitor countries. In China, Japan, South Korea and the US, between 69% and 80% of the researchers are employed in the business enterprises sector.

While the overall number of researchers employed in China is the highest worldwide, in relative terms, researcher employment China is still lagging behind. The Nordic countries have the highest researcher employment rates, followed by Japan, South Korea and the US. The lowest rates - apart from China - can be found in the southern and eastern European countries (see Figure 3.2.5).

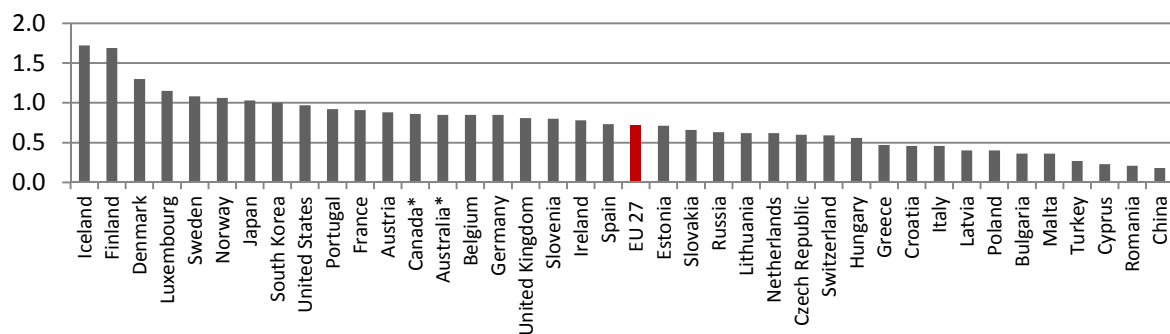
Table 3.2.1: Full Time Researchers by Sector of Performance (2010 or latest year available)

	Researchers (FTE) - Total	Researchers (FTE) - Business Enterprise Sec- tor	Researchers (FTE) - Higher Edu- cation Sec- tor	Research- ers (FTE) - Govern- ment Sec- tor
China	1.592.420	1.092.213	261.237	238.970
EU 27	1.564.770	708.345	640.276	198.555
United States	1.412.639	1.130.500		
Japan	656.032	492.805	123.549	32.050
Russia	442.071	211.214	84.359	145.056
Germany	327.500	187.000	89.600	50.900
South Korea	236.137	182.901	34.773	15.552
United Kingdom	235.373	80.561	142.727	8.135
France	234.201	133.536	68.696	28.702
Canada*	146.324	86.964	49.850	9.170
Spain	134.653	45.377	64.590	24.377
Italy	105.846	41.674	43.470	16.672
Australia*	92.379	29.085	53.340	8.285
Poland	64.511	11.729	39.170	13.553
Turkey*	57.759	21.019	31.037	5.703
Netherlands	52.066	24.907	20.200	6.959
Sweden	49.312	30.440	16.959	1.892
Portugal	45.916	10.363	28.830	2.526
Finland	41.425	22.904	13.548	4.551
Belgium	38.168	17.610	17.264	3.008
Austria	35.942	22.396	11.677	1.617
Denmark	35.326	21.481	12.535	1.133
Singapore*	32.031	16.508	13.766	1.757
Czech Republic	29.228	12.661	10.115	6.244
Norway	26.537	12.588	9.470	4.479
Switzerland	25.142	10.332	14.322	488
Hungary	21.342	10.274	6.041	5.027
Greece	21.013	6.286	12.382	2.201
Romania	19.780	5.853	8.245	5.590
Slovakia	15.183	1.928	10.203	2.999
Ireland	14.437	7.884	6.106	447
Bulgaria	10.932	1.491	3.608	5.757
Lithuania	8.387	1.242	5.677	1.468
Slovenia	7.703	3.389	2.262	2.036
Croatia	7.104	1.281	3.716	2.097

	Researchers (FTE) - Total	Researchers (FTE) - Business Enterprise Sec- tor	Researchers (FTE) - Higher Edu- cation Sec- tor	Research- ers (FTE) - Govern- ment Sec- tor
Estonia	4.069	1.274	2.179	548
Latvia	3.807	611	2.629	567
Iceland	2.861	1.126	1.125	547
Luxembourg	2.536	1.360	518	658
Cyprus	895	190	530	95
Malta	588	336	224	29
Albania	n.a.	n.a.	n.a.	n.a.
Bosnia and Herzegovina	n.a.	n.a.	n.a.	n.a.
Faroe Is- lands	n.a.	n.a.	n.a.	n.a.
Israel*	n.a.	n.a.	n.a.	n.a.
Liechten- stein	n.a.	n.a.	n.a.	n.a.
Macedonia	n.a.	n.a.	n.a.	n.a.
Montenegro	n.a.	n.a.	n.a.	n.a.
Serbia	n.a.	n.a.	n.a.	n.a.

Data: Eurostat. Countries with * OECD

Figure 3.2.5: Researchers as Percentage of Total Employment (2010 or latest year available)



Data: Eurostat. Countries with * OECD

Differences can be observed regarding the share of female researchers among the total researcher population employed (see Figure 3.2.6). These differences concern the proportions that can be found when comparing countries generally, but can also be seen more specifically when analyzing the shares of female researchers across the different sectors in these countries (see Figure 3.2.7 to Figure 3.2.9). The highest share of female researchers are typically found in countries with a comparatively low R&D expenditure (GERD as % of GDP) (see Figure 3.2.10) and with a high share of researchers employed in the public sector (higher education and government sectors). In general, the share of female researchers in the public sector is higher than in the business enterprise sector.

Figure 3.2.6: Percentage of Female Researchers (FTE) – Total Researchers (2009 or latest year available)

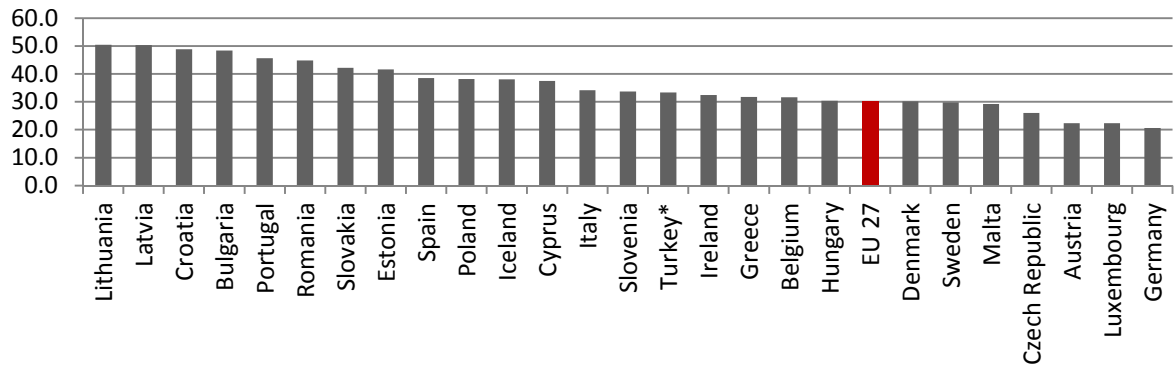


Figure 3.2.7: Percentage of Female Researchers (FTE) – Higher Education Sector (2009 or latest year available)

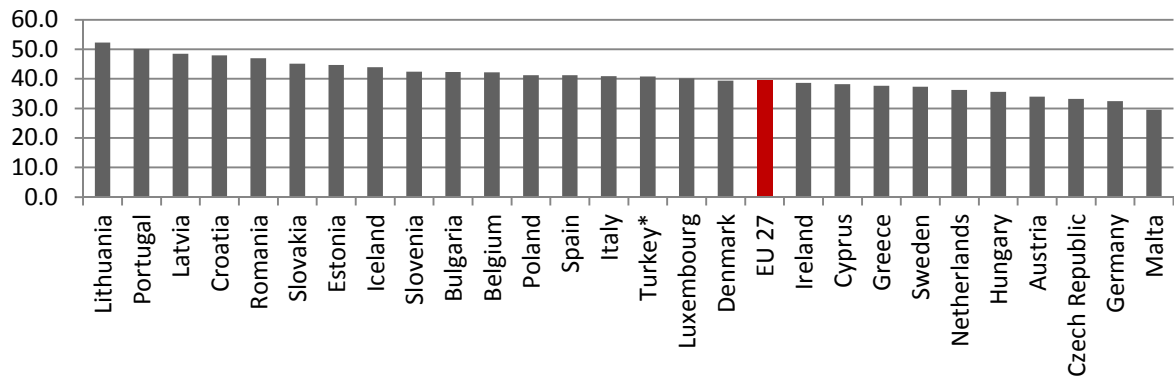


Figure 3.2.8: Percentage of Female Researchers (FTE) – Government Sector (2009 or latest year available)

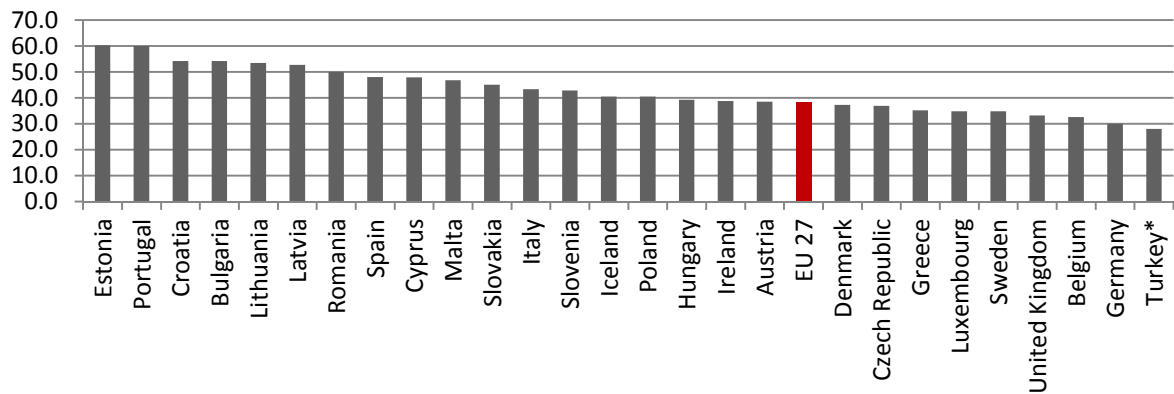
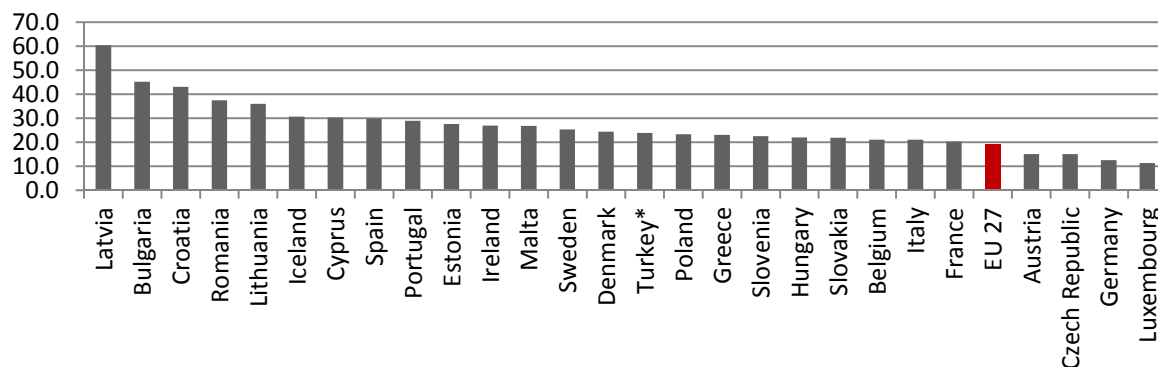
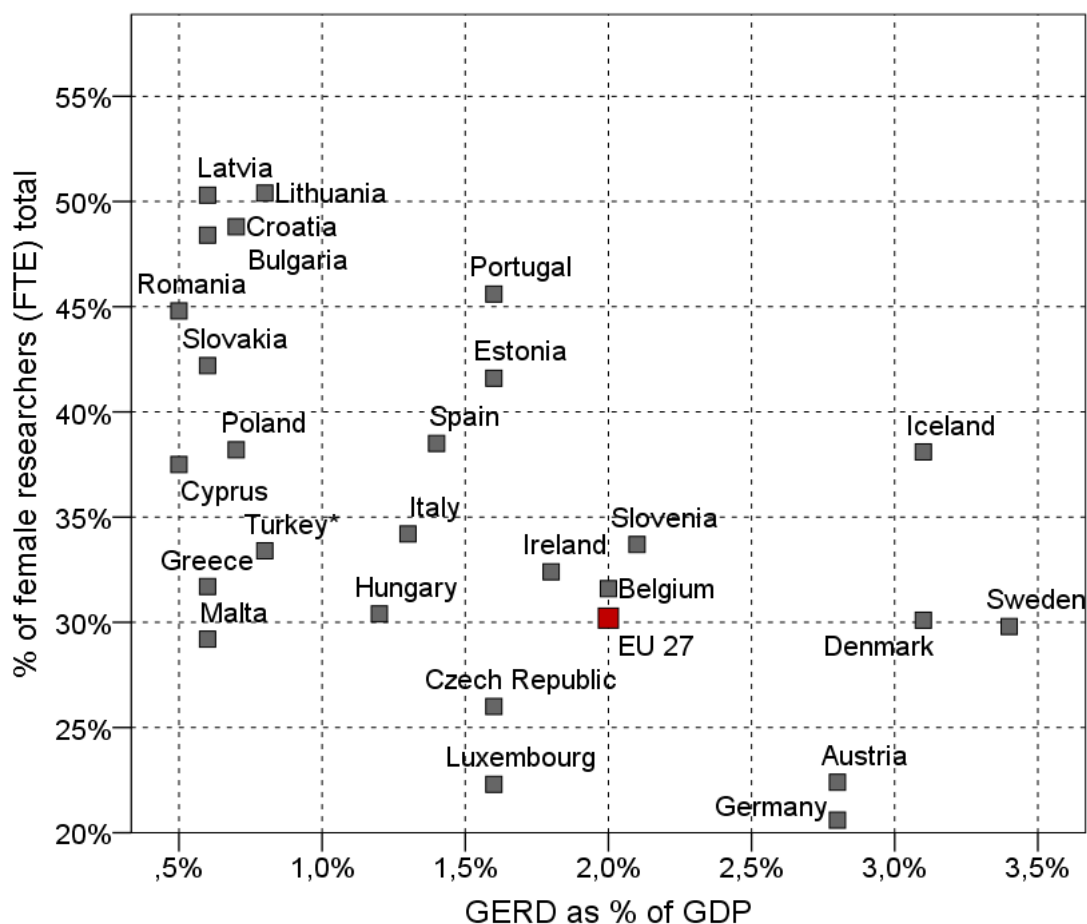


Figure 3.2.9: Percentage of Female Researchers (FTE) – Business Enterprise Sector (2009 or latest year available)



Data for Figure 3.2.6 to Figure 3.2.9: Eurostat. Countries with * OECD

Figure 3.2.10: Share of female researchers (FTE) in total researchers and GERD as % of GDP



Data: Eurostat. Countries with * OECD

Highly qualified staff is an indispensable precondition for successfully improving Europe’s performance in R&D and its competitiveness. In the EU, approximately 111,000 doctorates are awarded per year, almost twice as many as in the United States (European Commission 2011a, p. 5). Relatively speaking and taking into account the relevant age group, the share of doctoral graduates among individuals of the corresponding age group varies across countries. It is highest in Swit-

Switzerland (2.7%) and lowest in Malta (0.1%) (see Figure 3.2.11). Similar variations can be observed for the share of doctoral students among the most relevant age group (see Figure 3.2.12). Finland has the highest share of doctoral students. The obvious difference between the share of doctoral students and the share of graduates in Finland can be explained by the fact that in Finland (see Table 3.2.11) the average graduation age for doctoral students is between 35 and 37 and thus beyond the age group we are looking at when taking the Eurostat data as a reference.

Figure 3.2.11: Graduates (ISCED 6) aged 25-34 per 1 000 of the corresponding age population - doctorates awarded (2010 or latest year available)

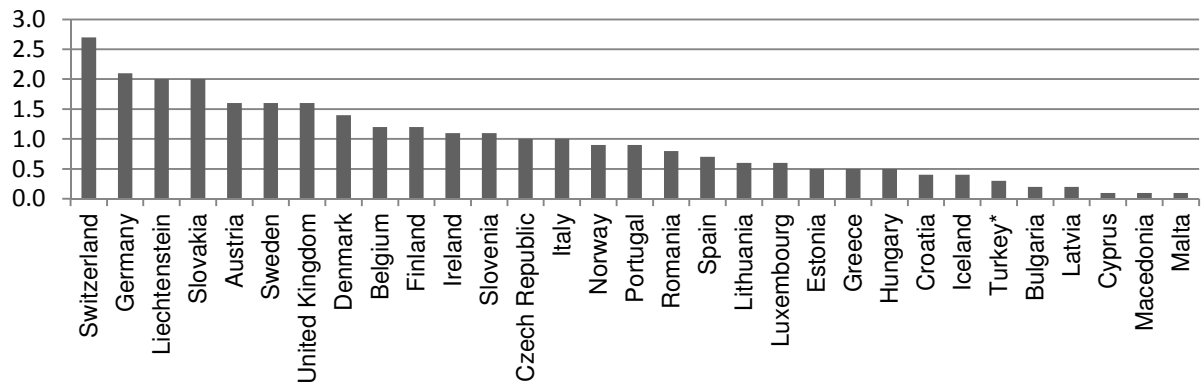
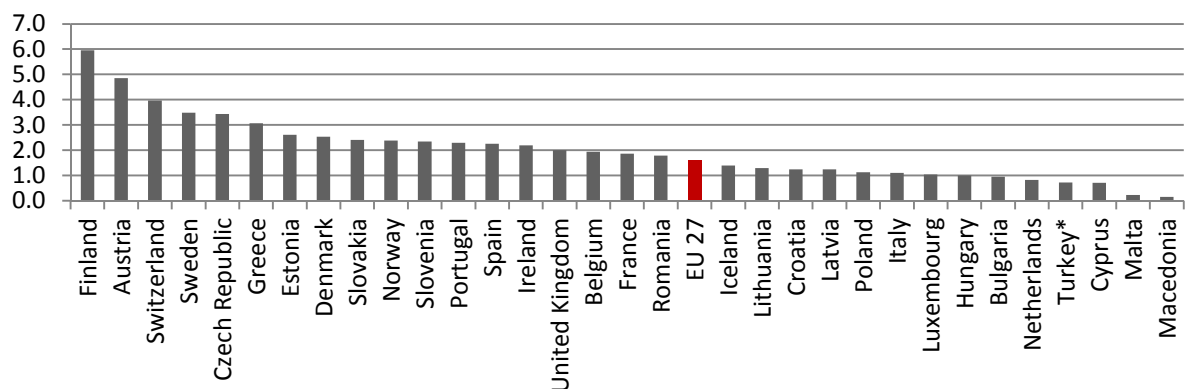


Figure 3.2.12: Doctoral students - percentage of the population aged 25-29 (2010 or latest year available)



Data for Figure 3.2.11 and Figure 3.2.12: Eurostat. Countries with * OECD

Let us now turn to the data gathered in the MORE2 study. Comparative information is provided in this chapter. All information is based on the country fiches compiled by the country correspondents.

3.2.2 Attractiveness of sectors for pursuing researcher careers

The relevance of various sectors to researchers' careers - based on the relevance of the sectors as research performing sectors - is illustrated above. To complement this approach, we asked the country correspondents for an assessment of the attractiveness of each sector. The results of these assessments across countries are provided in Table 3.2.2 and Table 3.2.3.

It should be taken into account that the assessment was provided by the individual country correspondents and is therefore highly subjective in nature. In addition, other than providing the country correspondents with brief guidelines about

which factors should be taken into account in their assessment, there was no attempt made to harmonize these assessments across countries.

Table 3.2.2: Share of countries and their rating for attractiveness of sectors for pursuing a researcher career (N=47 countries²²)

	HES (N=43)	GOV (N=41)	BES (N=44)	PNP (N=36)
Excellent	12%	4%	9%	0%
Good	67%	49%	49%	38%
Poor	21%	30%	32%	28%
Very Poor	0%	4%	4%	11%

Source: country fiches provided by country correspondents (Please note: country assessments are based on the view of individual country correspondents, no attempt has been made to harmonize answers for cross country comparisons); HES – Higher Education Sector, GOV – Government Sector, BES – Business Enterprise Sector, PNP – Private Non-Profit

According to Table 3.2.2, in the majority of countries the attractiveness of the HES, BES and the GOV sector for pursuing a researcher career is good, and in some countries, excellent. In general, the assessment between overall attractiveness of the sectors and their long-term attractiveness for pursuing a researcher career (see Table 3.2.3) seem to coincide. However, some differences can be observed. While the assessment of the actual attractiveness of the HES sector is “good”, and in parts “excellent” for the majority of countries, the share of “good” and “excellent” values drop slightly and the “poor” ratings increase accordingly.

Table 3.2.3: Share of countries and their rating for long-term attractiveness of sectors for pursuing a researcher career (N=47 countries²⁰)

	HES (N=44)	GOV (N=40)	BES (N=42)	PNP (N=37)
Excellent	14%	5%	10%	3%
Good	57%	43%	55%	38%
Poor	30%	45%	33%	43%
Very Poor	0%	8%	2%	16%

Source: country fiches provided by country correspondents (Please note: country assessments are based on the view of individual country correspondents, no attempt has been made to harmonize answers for cross country comparisons)

3.2.3 The Higher Education Sector (HES)

3.2.3.1 Autonomy and organization of Higher Education Institutions (HEI)

In the various ministerial declarations relating to the Bologna process, academic freedom and autonomy and accountability of higher education institutions are underlined as principles of the European Higher Education Area (EHEA). Here, we used a framework introduced by Estermann et al. (2011) which is based on differentiating between four basic dimensions of autonomy which were introduced by the European University Association (EUA) in 2007: academic autonomy; financial autonomy; organizational autonomy and staffing autonomy²³. Table 3.2.4 provides an overview of the issues in each of these four dimensions which should be considered when assessing HEIs’ *degree of autonomy*.

²² Please note: not all country correspondents provided the requested information. In each column the number of countries for which data is available is given. The shares are calculated not taking into account missing data.

²³ EUA (2007): Lisbon declaration. Europe’s Universities beyond 2010: Diversity with a common purpose.
http://www.eua.be/fileadmin/user_upload/files/Lisbon_Convention/Lisbon_Declaration.pdf

Table 3.2.4: Relevant issues to be considered for assessing the four basic HEI autonomy categories

Organizational autonomy	Financial autonomy	Staffing autonomy	Academic autonomy
<ul style="list-style-type: none"> - Selection procedure for the executive head - Selection criteria for the executive head - Dismissal of the executive head - Term of office of the executive head - Inclusion and selection of external members in governing bodies - Capacity to decide on academic structures - Capacity to create legal entities 	<ul style="list-style-type: none"> - Length and type of public funding - Ability to keep surplus - Ability to borrow money - Ability to own buildings - Ability to charge tuition fees for national/EU students (BA, MA, PhD) - Ability to charge tuition fees for non-EU students (BA, MA, PhD) 	<ul style="list-style-type: none"> - Capacity to decide on recruitment procedures (senior academic/senior administrative staff) - Capacity to decide on salaries (senior academic/ senior administrative staff) - Capacity to decide on dismissals (senior academic/senior administrative staff) - Capacity to decide on promotions (senior academic/senior administrative staff) 	<ul style="list-style-type: none"> - Capacity to decide on overall student numbers - Capacity to select students (BA, MA) - Capacity to introduce programmes (BA, MA, PhD) - Capacity to terminate programmes - Capacity to choose the language of instruction (BA, MA) - Capacity to select quality assurance mechanisms and providers - Capacity to design content of degree programmes

Source: Estermann et al. 2011, p. 20

Agreement seems to exist, to the greatest extent, with regard to the academic autonomy granted to the HEI. In more than a quarter of all countries included in our analysis, academic autonomy is “very high” and, in addition “high” in half of the countries (see Table 3.2.5). Moreover, staffing decisions are mainly at the discretion of the HEI; more than half of the countries grant “high” or “very high” autonomy in this regard. More restrictions seem to apply with regard to financial autonomy. Here, the share of countries granting “high” or even “very high” autonomy to their HEI is smallest. In the majority of the countries (almost half of all countries included), the degree of financial autonomy has been assessed as “mixed”. Organizational autonomy in almost half of the countries is either “high” or “very high”. Only very few countries seem to severely limit the decision-making power of their HEI in this respect, with the degree of autonomy being assessed as “low”.

Table 3.2.5: Share of countries and their rating by autonomy dimension (N=47 countries²⁰)

	Academic Autonomy (N=46)	Financial Autonomy (N=46)	Organizational Autonomy (N=47)	Staffing Autonomy (N=45)
Very High	28%	7%	19%	29%
High	50%	17%	30%	24%
Mixed	20%	48%	43%	31%
Low	2%	22%	6%	16%
Very Low	0%	7%	2%	0%

Source: country fiches provided by country correspondents, assessment by the individual country correspondents

With regard to the *differentiation of HEI*, we looked at two different dimensions: 1) the different forms of HEI across countries, regarding the tasks that the HEI fulfill; i.e. we differentiated between “teaching only institutions” and “teaching plus research institutions”;

2) the different internal organization models; i.e. the institute model (relatively few chair holders with many hierarchically subordinated assistants) or the department model (high number of professors at different levels). In the majority of

countries (70%) HEI engage in both tasks. In these countries, teaching only institutions do not exist while in a few (21%) teaching only institutions can also be found (see Table 3.2.6).

Table 3.2.6: Institutional differentiation of HEI within countries

Teaching-only HEI existent (N=10)	No teaching-only HEI existent (N=33)	Missing information (N=4)
Belgium, Bosnia and Herzegovina, Italy, Montenegro, Netherlands, Poland, Russia, Australia, Japan, South Korea	Albania, Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Macedonia, Norway, Portugal, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Israel, Canada, China, Singapore, USA	Liechtenstein, Turkey, Faroe Islands, Brazil

Source: country fiches provided by country correspondents, assessment by the individual country correspondents

Table 3.2.7 provides information with regard to the prevailing institutional model in the countries investigated. It is obvious that in the majority of countries, the department model is implemented (62%), while the institute or chair model is found in a minority (30%).

Table 3.2.7: Institutional models of HEI within countries

Institute / Chair model (N=14)	Department model (N=29)	Missing information (N=4)
Austria, Belgium, Bulgaria, Estonia, Germany, Hungary, Lithuania, Luxembourg, Serbia, Slovenia, Switzerland, China, Singapore, South Korea	Albania, Bosnia and Herzegovina, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Liechtenstein, Macedonia, Montenegro, Netherlands, Norway, Portugal, Romania, Spain, Sweden, Turkey, United Kingdom, Faroe Islands, Israel, Australia, Brazil, Canada, USA	Latvia, Poland, Russia, Japan

Source: country fiches provided by country correspondents

3.2.3.2 Training and qualification

With the Bologna declaration²⁴ in 1999, the Bologna process aimed to modernize European higher education. In 2010, the European Higher Education Area was officially launched²⁵. With the aim of improving the competitiveness of European Higher Education, a transparent and comparable system of academic degrees was to be introduced; the mobility of students and researchers to be promoted; and high quality training to be ensured (Bologna declaration 1999). The progress made and problems faced in this process have been analyzed and documented in various reports. It has been shown that the degree of implementation varies in the individual countries (see Budapest-Vienna declaration 2010). As regards doctoral training, differences are still obvious. Within the context of the MORE2 study, we asked the country correspondents to provide information concerning PhD training. In particular, we asked which institutions provide respective training and award doctoral degrees and – if existent - further academic degrees and to what extent structural PhD programs have been introduced. In addition and with regard to career progression we asked at what age on average a) PhD candidates graduate, b) researchers obtain their first permanent position, c) obtain tenure and d) obtain a professorial position.

Universities are the predominant institutions awarding academic degrees. In more than two thirds of the countries only universities award doctoral degrees, and if required, consecutive degrees and / or qualifications. In 10 countries (see Table 3.2.8) other kinds of institutions universities are granting doctorate degrees.

Table 3.2.8: Countries where other institutions besides universities are granting academic degrees / qualifications

Countries where also non-university institutions are granting academic degrees / qualifications	
Doctorates	Consecutive degrees / qualifications
Belgium, Bosnia and Herzegovina, Denmark, Ireland, Luxembourg, Romania, Russia, Switzerland, Brazil, China	Bulgaria, Russia, Spain

Source: country fiches provided by country correspondents

In the majority of countries (33 out of 47 countries, 70%), academic degrees or qualifications beyond the doctorate are not a required precondition for pursuing a researcher career. However, in four countries - while not mandatory - the tradition to pursue this kind of further qualification (such as the habilitation in Germany) still exists (see Table 3.2.9). In 28% of the countries (13 out of 47, see Table 3.2.9) it is a mandatory precondition²⁶. Again, it is primarily universities which are awarding these degrees / qualifications (see Table 3.2.9 for countries where also non-university institutions grant academic degrees / qualifications).

²⁴ http://www.bologna-bergen2005.no/Docs/00-Main_doc/990719BOLOGNA_DECLARATION.PDF

²⁵ http://www.ehea.info/Uploads/news/Budapest-Vienna_Declaration.pdf

²⁶ Information on one country (2.2%) the information is not specified.

Table 3.2.9: Countries with consecutive academic degrees beyond the doctorate

Consecutive degree / qualification required	Consecutive degree / qualification not required but tradition
Bulgaria, Czech Republic, France, Hungary, Italy, Liechtenstein, Lithuania, Poland, Romania, Russia, Slovenia, Spain, Switzerland	Austria, Germany, Sweden, Brazil

Source: country fiches provided by country correspondents

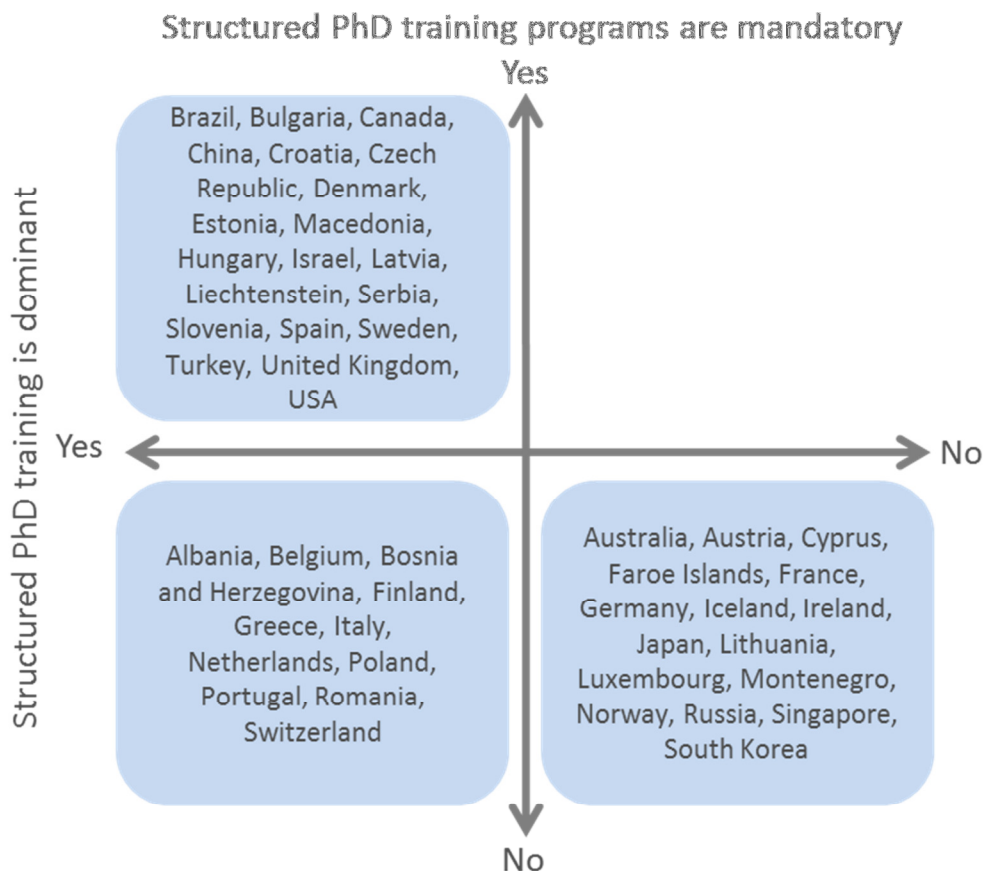
The picture across countries with regard to the form in which doctoral education is offered is ambiguous and, not only in Europe. Doctoral training is provided either in structured programs or as individually supervised doctorate. In the majority of countries structural PhD training is not mandatory (see Figure 3.2.13). However, often it is the predominant form doctoral education takes (see Table 3.2.10).

Table 3.2.10: Relevance of structured PhD training programs (N=47)

Share of countries where structured PhD training programs are mandatory	Share of countries where structured PhD training programs are predominant
43%	66%

Source: country fiches provided by country correspondents

Figure 3.2.13: Implementation of structured PhD training programs



Data: based on country fiches provided by MORE2 network of national experts

Also with regard to the age at which a doctorate is obtained, we observe variations across countries. Graduating at an average age of 30 years or younger is the exception (see Table 3.2.11). In most countries, graduates are on average between 31 and 34 years old. Particularly in the Nordic countries, the doctorate is obtained somewhat later, on average between the ages of 35 and 37. In Brazil, Israel and South Korea PhD graduates are, on average, older than 38 years.

Table 3.2.11: Average age range for obtaining a PhD

≤30 year	31-34	35-37	≥38 year
Belgium, Cyprus, Ireland, Lithuania, Luxembourg, Serbia, United Kingdom	Albania, Australia, Austria, Bulgaria, Canada, China, Czech Republic, Denmark, France, Germany, Greece, Italy, Japan, Netherlands, Poland, Spain, Switzerland, Turkey, USA	Croatia, Estonia, Finland, Hungary, Iceland, Montenegro, Norway, Portugal, Romania, Slovenia, Sweden	Brazil, Israel, South Korea

Data: based on country fiches provided by MORE2 network of national experts

3.3 General description of career paths and working conditions

In this section general features, which are characteristic for the various positions available, will be described. In particular the focus will be on: the type and length of contracts, the status and the degree of autonomy granted to the individuals holding a position. In addition, the relevance of mobility for researcher careers will be tackled as well as the extent to which performance assessments are implemented in the decision-making process regarding career progression.

Not surprisingly, as career stages progress, the share of countries awarding permanent positions to the holders of the respective positions is also increasing (see Table 3.3.1). In the vast majority of the countries, researchers at the beginning of their careers are offered only temporary contracts, while researchers holding positions in the R4 career stage are primarily awarded permanent positions.

Table 3.3.1: Type of contract awarded by career stage (total N=47 countries²⁰)

Career stage	Temporary contracts only	Permanent contracts only	Either permanent or temporary contracts
R1 (N=46)	91%	9%	0%
R2 (N=44)	80%	16%	5%
R3 (N=45)	33%	53%	13%
R4 (N=43)	16%	77%	7%

Data: based on country fiches provided by MORE2 network of national experts

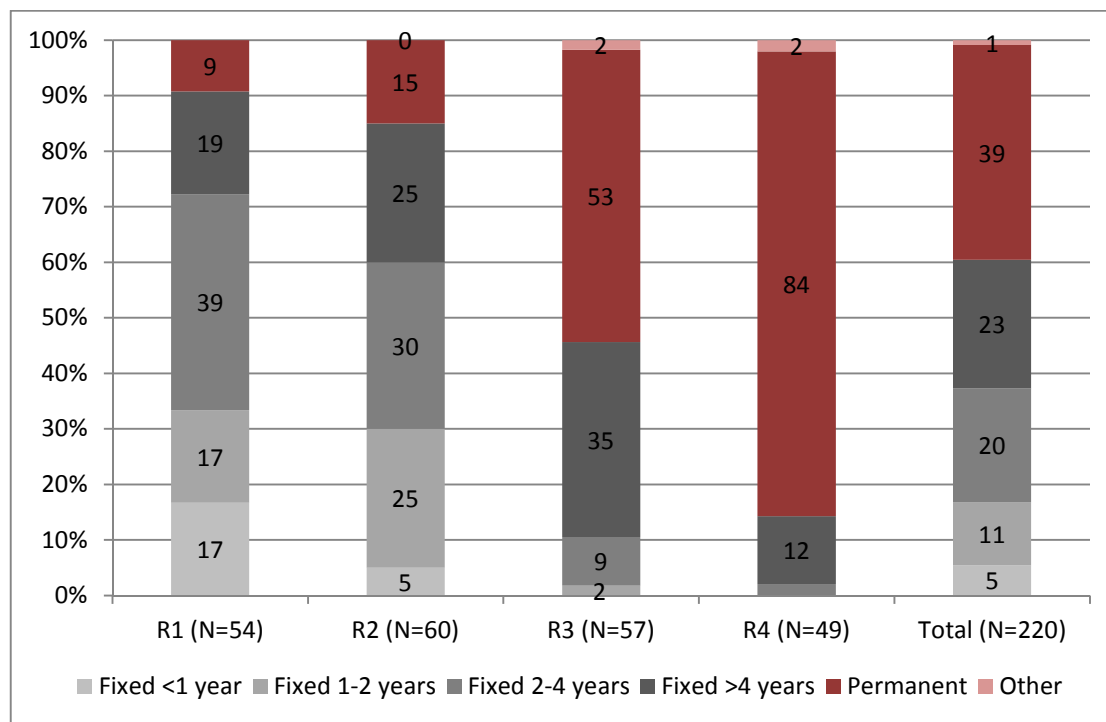
Temporary contracts differ in terms of their length. We asked for the average duration of these contracts, differentiating by career stage and between four different duration ranges.

Methodological Remark

Country correspondents were asked to provide information on all positions that are available in the academic system at each of the career stages. In general, there is more than just one position assigned to a career stage. Across all countries and career stages information has been provided on 246 positions (R1=62 positions; R2=67 positions; R3=63 positions; R4=54 positions). When calculating shares, the basis for calculation is not the number of countries but the number of different positions, employment status etc. identified. Still, due to lacking data about the number of researchers per position and per career stage, this procedure does not allow an estimation as regards the number of researchers holding these positions or positions with a specific characteristic (such as employment status). In addition, not all information requested was provided for each position. When calculating shares, the missing data was disregarded but, in any, case the total number of positions taken into account when calculating shares is provided (N=...) in the tables or graphs.

Based on the analysis of all positions related to the four career stages that were identified, we can see that not only the share of permanent positions is increasing along the career path but, also, that increasingly longer lasting contracts are provided (see Figure 3.3.1). In particular, R1 and R2 positions are based on rather short running contracts to a significant extent (i.e. contracts of more than one quarter of these positions lasts only up to two years). R1 positions also involve a significant share of contracts lasting between 2 and 4 years and thus, could last approximately for the expected average length of the PhD phase.

Figure 3.3.1: Length of contracts offered by career stage (% of all positions within a career stage across all countries²⁷)

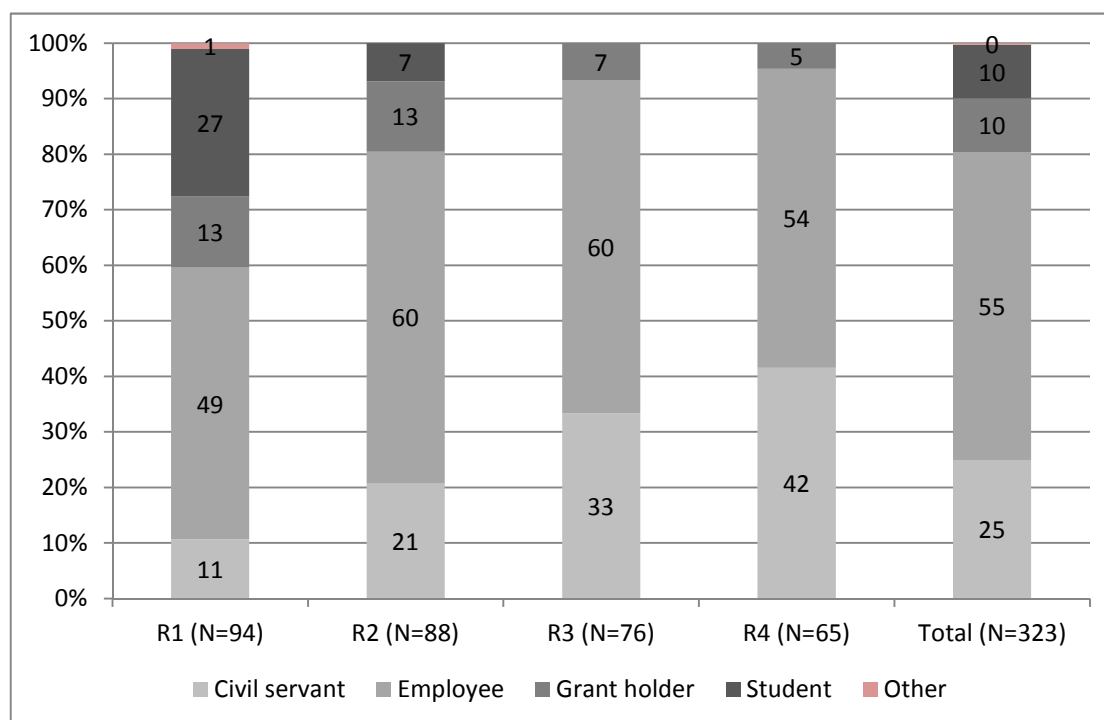


Data: based on country fiches provided by MORE2 network of national experts

Figure 3.3.2 reflects the employment status related to the positions held by researchers. Again, the calculation is based on the number of different options related to the various positions named by the country correspondent and multiple employment options can be assigned to a position. Also in this context, progression along the career path becomes obvious. Most positions, no matter at which career stage, are potentially employee positions, as shown before, with different conditions as regards length of contracts. The share of positions that can be granted civil servant status increases by career stage and is highest at the R4 level. Grant holders can be found across all career stages. Also at the R1 level the majority of researcher positions can be granted as employee positions - here approx. 27% of the positions are assigned student status, and 13% are grant holder positions. Student positions can still be found at the R2 level, but to a lesser extent, while the share of grant holder positions remains at the same level.

²⁷ Please note: missing data has been disregarded for calculating shares reflected in the graph. Total N gives the information on positions for which data has been provided by the country correspondents.

Figure 3.3.2: Status of individuals holding a position by career stage (% of all options offered with the positions available²⁵)



Data: based on country fiches provided by MORE2 network of national experts

In most countries, funding for the majority of researchers at all career stages comes from block funding (see Table 3.3.2). This share is highest for positions at the R4 level and lowest at the R2 level.

Table 3.3.2: Source of financing for positions by career stage (N=47²⁰)

	R1 (N=44)	R2 (N=46)	R3 (N=47)	R4 (N=47)
Majority funded by block funding	27 (61%)	26 (57%)	34 (72%)	36 (77%)
Majority funded by competitive funding	4 (9%)	5 (11%)	2 (4%)	1 (2%)
Balance between block and competitive funding	7 (16%)	6 (13%)	4 (9%)	3 (6%)
Either block or competitive funding	2 (5%)	3 (7%)	2 (4%)	0 (0%)
Not specified	4 (9%)	6 (13%)	5 (11%)	7 (15%)

Data: based on country fiches provided by MORE2 network of national experts

There are, however, a few countries where the majority of researchers at each career stage are financed by competitive funding:

At the R1 level: Albania, Australia, Iceland, Portugal,

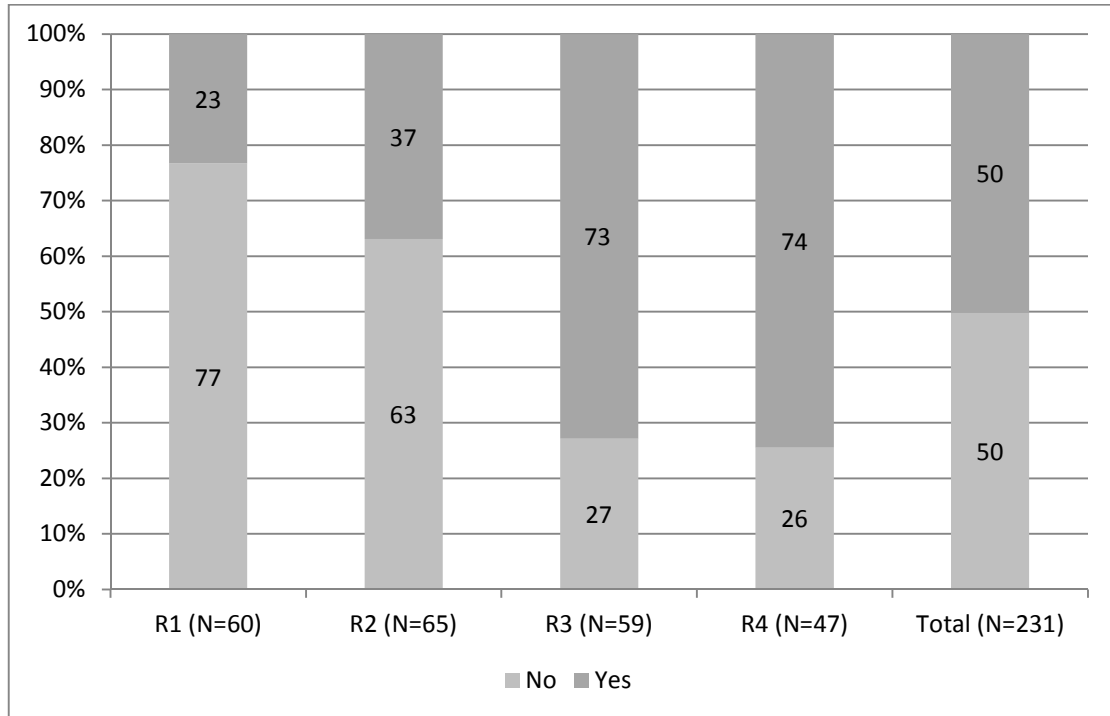
at the R2 level: Belgium, Iceland, Ireland, Romania, United Kingdom,

at the R3 level: Albania, Sweden and

at the R4 level: Netherlands.

While tenure track options are already provided for positions available at the R1 and R2 level, these become more common at the R3 and R4 level (see Figure 3.3.3). Here, the majority of the positions provided (more than 70 percent) offer tenure track options. At first sight, it might be surprising that at the R4 level the share of positions providing tenure track options is not considerably higher than is the case at the R3 level. But when looking at the issue of career reliability, the information about permanent positions also needs to be taken into account and their share is higher at the R4 level (see Table 3.3.3). While also at the R3 level the majority of positions are either permanent or with tenure track option, the higher share of the latter taken together with the higher share of temporary positions that do *not* offer tenure track options, inherently includes a higher risk with regard to whether or not a career can be sustainably pursued in academia.

Figure 3.3.3: Share of positions offering tenure track by career stage (% of all positions named²⁵)



Data: based on country fiches provided by MORE2 network of national experts

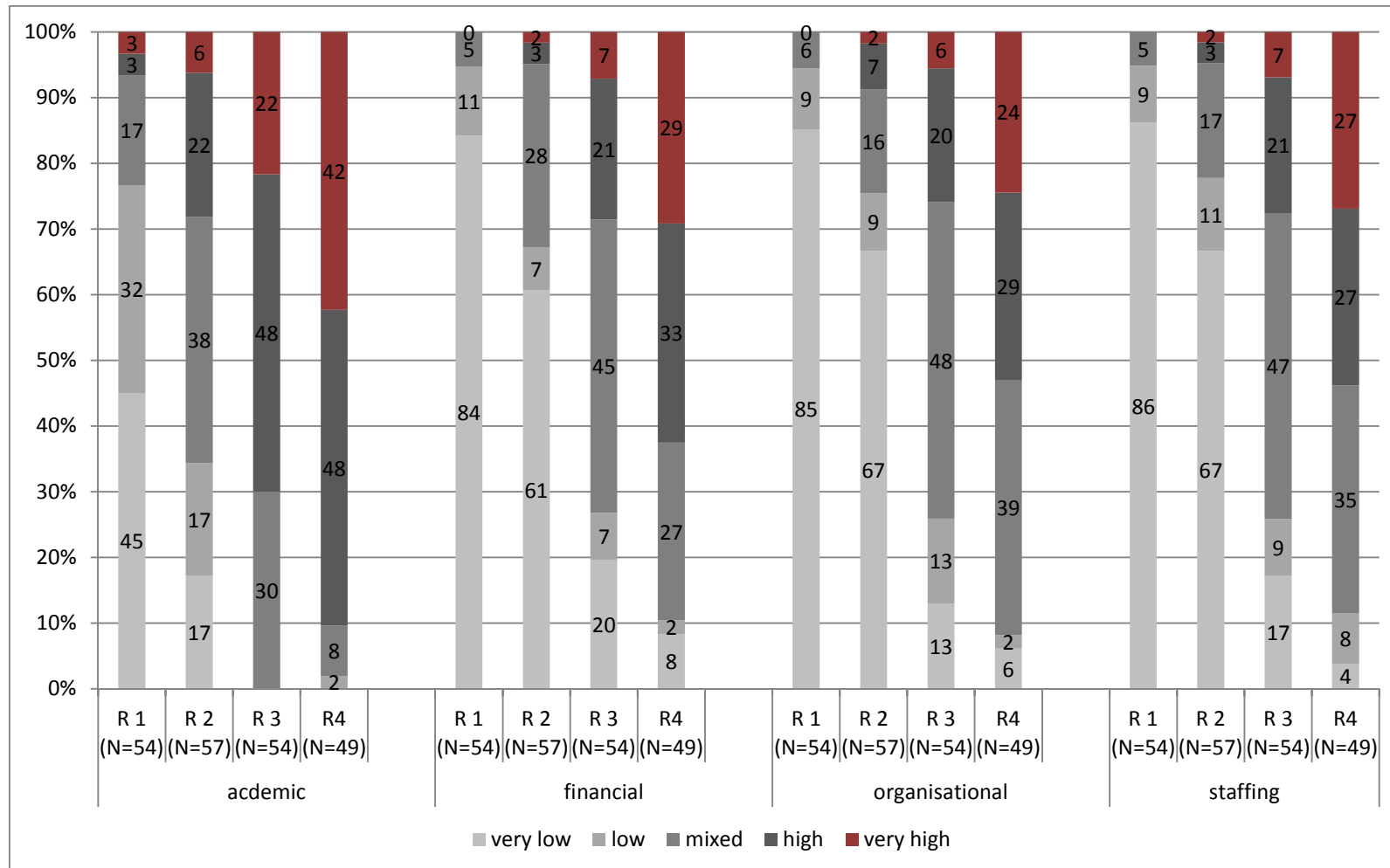
Table 3.3.3: Positions offering tenure track options or are permanent at the R3 and the R4 level (% of positions across countries²⁵)

	R3 (N=59)	R4 (N=46)
Permanent with tenure track option	28 (47%)	29 (63%)
Permanent without tenure track option	7 (12%)	7 (15%)
Temporary with tenure track option	15 (25%)	5 (11%)
Temporary without tenure track option	9 (15%)	5 (11%)
Tenure track option or permanent	50 (85%)	41 (89%)

Data: based on country fiches provided by MORE2 network of national experts

Conditions at the various career stages vary in terms of the autonomy granted to researchers. Following the differentiation applied at the level of HEI when assessing autonomy, we asked for an assessment of the autonomy granted to researchers holding a position at a certain career stage. Figure 3.3.4 shows that – not surprisingly – the degree of freedom a researcher has in all four dimensions increases along the career path. A significant gain in autonomy already takes place when moving from R2 to R3. But the move from R3 and R4 is particularly characterized by a significant increase towards the highest degree of autonomy.

Figure 3.3.4: Autonomy in four dimensions granted to researchers by career stage²⁵



Source: country fiches provided by country correspondent

At what age is a specific career stage is typically obtained? And how fast can a researcher progress across the four career stages? Table 3.3.4 and Table 3.3.5, respectively, provide aggregated information across countries and country specific information. Table 3.3.5 highlights typical career progression by country. In more than half of the countries considered, researchers enter the R1 stage before the age of 30, another quarter at the mid-thirties. The “speed” of progressing along the career path differs between countries. Career progression can be particularly fast and starts at an early age in Serbia and Turkey. In contrary, in Israel and Brazil, researchers start at a comparatively advanced age and, thus, enter the following career levels with a respective “age delay”. Differences among countries also seem to exist with regard to the time a researcher remains at a certain level. Delays can occur moving between any of the four age groups: between R1 and the R2 (Bosnia and Herzegovina, Croatia, Finland, Portugal, Spain), between R2 and R3 (Austria, Bulgaria, Ireland, Italy, Netherlands, Switzerland, United Kingdom, USA) and between R3 and R4 (Cyprus, Lithuania, Portugal) (delay here seen as a entering the next level not at an age falling in the directly successive age group).

Table 3.3.4: Age at which a position in the respective career stage is typically reached (% of countries) (N=47²⁰)

	R1 (N=39)	R2 (N=37)	R3 (N=34)	R4 (N=35)
<30	64%	16%	0%	0%
31-35	28%	49%	15%	0%
36-40	3%	30%	44%	6%
41-45	5%	3%	35%	29%
46-50	0%	3%	3%	46%
51-55	0%	0%	3%	14%
56-60	0%	0%	0%	6%

Data: based on country fiches provided by MORE2 network of national experts

Table 3.3.5: Typical age at which a position in respective career stage is obtained by country

Age range	R1	R2	R3	R4
≤30 year	Australia, Austria, Belgium, Bosnia and Herzegovina, Croatia, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Portugal, Serbia, Spain, Switzerland, Turkey, United Kingdom, USA	Belgium, Cyprus, Ireland, Lithuania, Netherlands, United Kingdom		
31-35	Albania, Bulgaria, Iceland, Japan, Luxembourg, Montenegro, Norway, Poland, Slovenia, South Korea, Sweden,	Australia, Austria, Bulgaria, Canada, China, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Luxembourg, Serbia, Slovenia, Switzerland, Turkey, USA	Canada, Cyprus, France, Lithuania, Turkey	
36-40	Romania	Bosnia and Herzegovina, Croatia, Finland, Iceland, Japan, Montenegro, Poland, Portugal, South Korea, Spain, Sweden,	Albania, Australia, Bosnia and Herzegovina, Czech Republic, Denmark, Estonia, Germany, Ireland, Japan, Netherlands, Serbia, Slovenia, South Korea, Spain, United Kingdom	Serbia, Turkey
41-45	Brazil, Israel,	Israel	Austria, Bulgaria, Croatia, Finland, Hungary, Italy, Luxembourg, Montenegro, Portugal, Sweden, Switzerland, USA	Australia, Cyprus, Estonia, France, Germany, Hungary, Ireland, Luxembourg, Slovenia, United Kingdom
46-50		Brazil	Israel	Bosnia and Herzegovina, Bulgaria, China, Czech Republic, Denmark, Finland, Japan, Latvia, Lithuania, Montenegro, Netherlands, Romania, Spain, South Korea, Sweden, USA
51-55			Brazil	Croatia, Israel, Italy, Poland, Portugal,
56-60				Brazil, Russia

Data: based on country fiches provided by MORE2 network of national experts

We also asked the country correspondents about selection procedures for filling researcher positions. In general terms, researcher positions are advertised, but the level at which this is done differs, however, between countries (see Table 3.3.6). While in a number of countries positions have to be advertised at least at the institutional level, in the majority of countries they are advertised at least nationally. Internationally advertising researchers' positions is not yet a required standard procedure.

Table 3.3.6: Channels for advertising researcher positions

Institutional	National	International
Albania, Canada, Cyprus, Denmark, Estonia, Faroe Islands, Finland, Germany, Greece, Liechtenstein, Romania, Russia, Singapore, Slovenia, Sweden, USA	Australia, Bosnia and Herzegovina, Brazil, Bulgaria, China, Croatia, Czech Republic, France, Hungary, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Macedonia, Montenegro, Netherlands, Poland, Portugal, Serbia, South Korea, Spain, Switzerland	Austria, Belgium, Iceland, Ireland, Norway, United Kingdom

Data: based on country fiches provided by MORE2 network of national experts

While in the majority of countries this is not the case, in Austria, Bulgaria, Czech Republic, Greece, Hungary, Italy, Romania, Serbia, Brazil, Canada selection criteria for selecting researchers are legally predefined.

In the majority of countries, career progression depends on researchers' performance. The extent to which performance influences career progression differs among countries. While in Albania, Bosnia and Herzegovina, Bulgaria, Canada, France, Germany, Greece, Italy the system is characterized by at least "some performance orientation". In the majority of countries (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Faroe Islands, Finland, Iceland, Ireland, Israel, Japan, Latvia, Liechtenstein, Macedonia, Montenegro, Netherlands, Norway, Poland, Portugal, Serbia, Singapore, Slovenia, South Korea, Spain, Switzerland, Turkey, United Kingdom, USA) career progression is particularly dependent on the researchers' performance.

In more than one third of the countries, international mobility meanwhile is a prerequisite for pursuing an academic career. In additionally 17% of the countries this is at least the case in selected areas. In approximately one quarter of countries, international mobility is not a required feature for pursuing a researcher career (see Table 3.3.7). National schemes to support and enhance international mobility have been introduced in 45% of the countries investigated (see Table 3.3.8 for the countries). In approx. as many countries, no specific national schemes exist but the support for international mobility depends on the schemes implemented at the European level.

Table 3.3.7: *Is International mobility a prerequisite for pursuing a research career?*

Yes	16 (34%)
No	13 (28%)
In certain areas	8 (17%)
Missing	10 (21%)

Data: based on country fiches provided by MORE2 network of national experts

Table 3.3.8: *Countries where International mobility is a pre-requisite for a researcher’s career*

International mobility is a pre-requisite for a researcher’s career:		
Yes	In certain areas	No
Albania, Austria, Bulgaria, Denmark, Macedonia, Germany, Hungary, Luxembourg, Slovenia, Spain, Switzerland, Turkey, Faroe Islands, Israel, China, South Korea	Belgium, Croatia, France, Greece, Italy, Montenegro, Netherlands, Russia	Belgium, Croatia, Cyprus, Czech Republic, Estonia, France, Greece, Italy, Liechtenstein, Lithuania, Montenegro, Netherlands, Poland, Portugal, Romania, Russia, United Kingdom, Canada, Japan, Singapore, USA

Based on the data presented so far, at first sight, the general picture across countries with regard to the conditions for pursuing research careers appears to be rather scattered. We will address in the following sections whether we can identify groups of countries with commonalities in terms of working conditions

3.4 Country classification for each career stage

Academic careers develop in stages, but do these career stages mean the same for all academics around the world? We can raise doubts about this assumption because already at the first career stage we know that doctoral education or early research training phases are organized differently in different countries. Our aim with the analysis per career stage is threefold: 1) to group countries according to their characteristics per career stages, 2) to identify factors that present the main dividing line between countries and 3) to generate a perspective on the sequence, timing and likelihood of academic careers by covering all career stages.

In section 3.4.1, we present the country comparisons for each career stage and in section 3.4.2 an overall perspective on all four career stages is derived. The methods used to generate the cluster solutions are described in section 3.1.4.

3.4.1 Analysis for each career stage

3.4.1.1 Career stage R1

The main features of career stage R1 can be described as follows: In general, at this stage we find young researchers aged 30 years or even younger who are employed based on block-funded temporary contracts. Their autonomy is rather low and tenure-track options hardly exist.

The cluster analysis resulted in a five cluster solution that provides the best fit when we distinguish between the countries on the basis of the conditions granted to researchers at this stage (see Table 3.4.1)²⁸. In the following, the specificities reflected will be briefly discussed.

Cluster R1.1 contains 19 countries and the basic conditions for researchers fit the general characteristics described above. Typical for countries in this cluster is that researchers have both teaching and research obligations.

Cluster R1.2 covers 14 countries; again the main characteristics correspond to those outlined above. In contrast to cluster R1.1 researchers in these countries primarily engage in research only activities rather than in both types of academic activities.

Cluster R1.3 comprises six countries. The general characteristics are again in line with those described above. However, the distinguishing characteristic is that researchers may be already granted a tenure track-option.

Five countries are included in cluster R1.4. Unfortunately, the common feature for these countries is that important information allowing these countries to be assigned to any of the other clusters is missing. Thus, this cluster does not reveal any additional distinctive category of countries.

Cluster R1.5 contains three countries and the distinguishing factor is the type of contract which is offered to the researchers at this stage. In these countries, R1-stage researchers already have permanent contracts. Furthermore, the researchers are comparably old (41-45 years of age), they engage in teaching and research activities, and their positions are, as was already described as a main feature for the R1 stage, funded by block funding.

Our five clusters point to few specific characteristics that differentiate the groups of countries. Moreover, three of the five clusters (clusters R1.3-R1.5) contain rather small numbers of countries. It can be concluded that the main features of the R1 level are rather similar: a limited number of countries differ with regard to a limited number of characteristics.

The classification of countries into a cluster does not correspond with countries' belonging to certain world region or other possible traditional influences such as Commonwealth membership. Non-European countries are not more prominent in one of these clusters. Within Europe one pattern may be worth noting however: Southern European countries such as France, Spain, Italy and Portugal are classified in cluster 2, thus, researchers at the R1 level in these countries are focusing more prominently on research-only tasks. The only exception among the Southern European countries is Greece, which belongs to cluster R1.1.

The assignment of countries to the five clusters is given in *Table 3.4.1*.

²⁸ The process to determine the number of clusters suitable for a career stage contains two stages: 1) we identify the best solutions suggested in statistical terms by the Calinski/Harabasz pseudo-F parameter. 2) We verify that this solution provides us with meaningful differences between clusters and that the number does not exceed the number of variables chosen.

Table 3.4.1: Short description of R1-career stage cluster solution²⁹

Cluster	Characteristics	Number of countries	Countries
R1.1	under 30 -35 years, temporary contracts, mostly research and teaching oriented, low level of autonomy, mostly block funded, no tenure-track option	19	Albania, Bulgaria, Czech Republic, Denmark, Germany, Greece, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Poland, Slovenia, Sweden, Switzerland, United Kingdom, Canada, Singapore, USA
R1.2	mostly under 30 years, temporary contracts, research oriented, low level of autonomy, mostly block funded, no tenure-track option	14	Austria, Belgium, Croatia, Finland, France, Italy, Montenegro, Norway, Portugal, Spain, Turkey, Australia, Japan, South Korea
R1.3	under 30 years, temporary contracts, research and/or teaching oriented (equally distributed), low level of autonomy, block funded, tenure-track option	6	Bosnia and Herzegovina, Cyprus, Estonia, Hungary, Netherlands, Serbia
R1.4	Missing information	5	Macedonia, Liechtenstein, Russia, Faroe Islands, China
R1.5	36-45 years, permanent contracts, research and teaching oriented, low to middle level of autonomy, mostly block funded, tenure-track option	3	Romania, Israel, Brazil

3.4.1.2 Career stage R2

The main features of career stage R2 can be described as follows: mainly researchers in their early 30s who are employed on block-funded temporary contracts, engaged in both teaching and research tasks and having a low level of autonomy.

At career stage R2 a five cluster solution also provides the best fit for distinguishing between the countries' conditions of researchers in this stage (see Table 3.4.2)³⁰. In the following, the corresponding specificities will be briefly discussed.

Cluster R2.1 contains 16 countries; R2-researchers fit the general R2-stage characteristics described above. In addition the common feature for these countries is that researchers at the R2 stage are not offered a tenure-track option.

Cluster R2.2 includes 13 countries; R2-researchers possess the general R2-stage characteristics described above. In contrast to the Cluster R.2.1 in these countries R2-researchers are offered a tenure-track option³¹.

Cluster R2.3 includes seven countries; R2-researchers differ from the general R2-stage characteristics in terms of their age, funding regime and task division. Researchers in these countries obtain a position at the R2 stage comparatively late, namely in their mid to late 30s, they are more frequently exposed to competitive

²⁹ The descriptive statistics for each cluster by variable used to classify countries are presented in the appendix 7.1.1.

³⁰ The process to determine the number of clusters suitable for a career stage contains two stages: 1) We identify the best solutions suggested in statistical terms by the Calinski/Harabasz pseudo-F parameter. 2) We verify that this solution provides us with meaningful differences between clusters and that the number does not exceed the number of variables chosen.

³¹ Three countries classified into this Cluster R2.2 do not provide a tenure-track option at this career stage.

funding (compared to the other clusters) and are more specialized as they may have either research-oriented or teaching-oriented positions.

Cluster R2.4 contains eight countries, R2-stage researchers differ from the general R2-stage characteristics in terms of their age, funding regime and type of contract. While the picture with regard to the age at which researchers move to a R2 position in these countries is rather scattered, they are more frequently exposed to competitive funding (compared to the other clusters), are employed on permanent contracts and their positions include a tenure-track option.

Cluster R2.5 contains three countries. Unfortunately, again, the main feature leading to the fact that these countries are grouped in one cluster is missing information so that an assignment to any of the other clusters is not possible.

The majority of countries (29 of 47; cluster 1 and 2) represent a somewhat coherent R2 career stage. However, countries in clusters 3 and 4 are notably different with regards to the characteristics identified for those in clusters 1 and 2.

Based on the clusters identified, we see that the East-Asian countries are characterized by similar features with regard to the R2-career stage. These countries are represented in cluster R2.1; South Korea being an exception. Other notable groups of countries, allowing to distinguish between regions or traditional developments, within clusters are not found or only if focusing on neighboring countries such as Belgium and Netherlands (both in cluster 4).

Table 3.4.2: Short description of R2-career stage cluster solution³²

Cluster	Characteristics	Number of countries	Countries
R2.1	mostly 31-35, temporary contracts, mostly research and teaching oriented, mostly low level of autonomy, mostly block funded, no tenure-track option	16	Czech Republic, Denmark, Estonia, Macedonia, France, Germany, Greece, Latvia, Luxembourg, Russia, Serbia, Turkey, Canada, China, Japan, Singapore
R2.2	mostly 31-35, mostly temporary contracts, mostly research and teaching oriented, mostly low level of autonomy, block funded, mostly tenure-track option	13	Austria, Bosnia and Herzegovina, Bulgaria, Cyprus, Hungary, Italy, Montenegro, Norway, Poland, Spain, Switzerland, Australia, USA
R2.3	mostly 36-40, temporary contracts, mostly research oriented, mostly low level of autonomy, block or competitive funded, no tenure-track option	7	Croatia, Finland, Iceland, Lithuania, Sweden, United Kingdom, South Korea
R2.4	variety of age ranges, mostly permanent contracts, research or research and teaching oriented, low to middle level of autonomy, block or competitive funded, tenure-track option	8	Belgium, Ireland, Netherlands, Portugal, Romania, Slovenia, Israel, Brazil
R2.5	Missing information	3	Albania, Liechtenstein, Faroe Islands

³² The descriptive statistics for each cluster by variable used to classify countries are presented in the appendix 7.1.2.

3.4.1.3 Career stage R3

In career stage R3, we identify a clear dividing line between countries regarding type of contract, task division and level of researchers' autonomy (see *Table 3.4.3*)³³. As such, there are no main features characterizing this career stage and no general description can be outlined. The cluster analysis leads to a four cluster solution, with one cluster again being formed due to missing data (Cluster R3.2). A dividing line is drawn between cluster R3.1 on the one side and clusters R3.3 and R3.4 on the other side.

In cluster R3.1, we find 15 countries where the R3-career stage is characterized by block funded temporary contracts³⁴, low levels of researcher autonomy, and positions focusing either on research or teaching. With regard to whether or not the positions offer tenure track-options, the picture is inconsistent, as some countries in this cluster do offer a tenure-track option³⁵ but others do not³⁶.

Cluster R3.3, contains 16 countries where the R3-career stage is characterized by (in most cases) block-funded contracts, mostly with tenure-track options, middle to high level of researchers' autonomy and in most countries researchers engage in research as well as teaching. This cluster is not consistent regarding the type of contract: In five countries of R3.3 cluster positions appointed with temporary contracts³⁷, in four countries positions with either temporary or permanent contracts can be found³⁸ and in seven countries these positions offer permanent contracts³⁹.

Cluster R3.4, contains 12 countries where the R3-career stage is characterized by block-funded permanent contracts, middle to high levels of researcher autonomy and researchers engaging in research and teaching. The major differences to cluster R3.3 is that in cluster R3.4 all countries provide permanent contracts to their R3 career stage researchers. Moreover, these positions tend to be obtained slightly later, namely when researchers are already in their early forties whereas in cluster R3.3 researchers tend to gain these positions in their late thirties.

Cluster R3.1 contains many countries from the former Republic of Yugoslavia, with the exception of Slovenia and other Eastern European countries such as Russia, Albania and Estonia. In addition, three of the four Eastern Asian countries belong to cluster R3.1. Other notable groups of countries which could allow us to distinguish between regions or traditional developments, were not identified.

³³ The process to determine the number of clusters suitable for a career stage contains two stages: 1) We identify the best solutions suggested in statistical terms by the Calinski/Harabasz pseudo-F parameter. 2) We verify that this solution provides us with meaningful differences between clusters and that the number does not exceed the number of variables chosen.

³⁴ In Albania, Liechtenstein, Romania and United Kingdom R3-career stage researchers have permanent contracts.

³⁵ These countries are: Bosnia and Herzegovina, Croatia, Liechtenstein, Montenegro, Romania, Serbia, Israel and Singapore.

³⁶ These countries do not offer a tenure-track option: Albania, Estonia, Former Yugoslav Republic of Macedonia, Russia, United Kingdom, China and South Korea.

³⁷ The countries in cluster R3.3 with temporary contracts are: Cyprus, Germany, Lithuania, Australia and Japan.

³⁸ The countries in cluster R3.3 with positions with temporary or permanent contracts are: Ireland, Sweden, Canada and USA.

³⁹ The countries in cluster R3.3 with permanent contracts are: Czech Republic, Denmark, Netherlands, Slovenia, Spain, Turkey and Brazil.

Table 3.4.3: Short description of R3-career stage cluster solution⁴⁰

Cluster	Characteristics	Number of countries	Countries
R3.1	majority is between 36 and 45 years old, mostly temporary contracts; research or teaching; mostly low level of autonomy; tenure-track option and no tenure-track option, block funding	15	Albania, Bosnia and Herzegovina, Croatia, Estonia, Macedonia, Liechtenstein, Montenegro, Romania, Russia, Serbia, United Kingdom, Israel, China, Singapore, South Korea
R3.2	Missing information	4	Greece, Latvia, Norway, Faroe Islands
R3.3	mostly 31-40 years old, temporary and permanent contracts are equally distributed, mostly research and teaching oriented, middle to high level of autonomy, mostly tenure-track option, mostly block funding	16	Cyprus, Czech Republic, Denmark, Germany, Ireland, Lithuania, Netherlands, Slovenia, Spain, Sweden, Turkey, Australia, Brazil, Canada, Japan, USA
R3.4	mostly 41-45 years old, permanent contracts, research and teaching oriented, middle to high level of autonomy, tenure-track option and no tenure-track option, block funding	12	Austria, Belgium, Bulgaria, Finland, France, Hungary, Iceland, Italy, Luxembourg, Poland, Portugal, Switzerland

3.4.1.4 Career stage R4

In general, the career stage R4 is characterized by researchers who obtain these positions in their 40s, are employed on block-funded permanent contracts and engage in research and teaching.

For R4, we found a five cluster solution as the best fit to distinguish between the countries' conditions of researchers in this career stage (see *Table 3.4.4*)⁴¹. In the following, the specificities reflected will be briefly discussed. In this solution the cluster R4.2 and R4.3 represent the majority of countries, they contain 36 out of the 47 countries.

Cluster R4.1 contains eight countries, with R4-stage researchers fitting the general characterization described above. In contrast to cluster R4.2 and R4.3, these researchers are *not* offered a tenure-track option.

Cluster R4.2 includes 17 countries fitting the general characterization of the R4 stage described above. In contrast to clusters R4.1 and R4.3 R4-researchers in these countries are mostly offered a tenure-track option and are granted a high level of autonomy.

Cluster R4.3 contains eleven countries, in which R4-stage researchers fit the general characterization described above. In addition, these positions offer a tenure-track option but (in contrast to R4.2) are only granted a medium level of autonomy.

Cluster R4.4 contains five countries where R4-researchers are facing conditions that differ from those in other countries regarding the type of contract, the tasks

⁴⁰ The descriptive statistics for each cluster by variable used to classify countries are presented in the appendix 7.1.3.

⁴¹ The process to determine the number of clusters suitable for a career stage contains two stages: 1) We identify the best solutions suggested in statistical terms by the Calinski/Harabasz pseudo-F parameter. 2) We verify that this solution provides us with meaningful differences between clusters and that the number does not exceed the number of variables chosen.

they have to engage in and their level of autonomy. The R4 positions in these countries are temporary, specialized in teaching or research and provide only a medium level of autonomy.

Cluster R4.5 includes six countries, with the main feature again being missing information, thus preventing any meaningful assignment of these countries to any of the other clusters.

The majority of countries (36 of 47 – clusters R4.1, R4.2 and R4.3) represent a rather coherent R4 career stage; the distinguishing feature however is whether the positions offer a tenure-track option and the level of autonomy a researcher is granted. In the R4-stage, we identified cluster R4.4 as being notably different as compared to the other clusters, regarding type of contract and the research and teaching nexus.

Notable groups of countries allowing distinguish regions or traditional developments, are not found within any cluster.

Table 3.4.4: Short description of R4-career stage cluster solution⁴²

Cluster	Characteristics	Number of countries	Countries
R4.1	mostly 46-50 years old, mostly permanent contracts, mostly research and teaching oriented, middle to high level of autonomy, no tenure-track option, block funding	8	Bosnia and Herzegovina, Denmark, Latvia, Lithuania, Montenegro, Russia, Spain, Sweden
R4.2	36-55 years old, permanent contracts, research and teaching oriented, mostly high level of autonomy, mostly tenure-track option, block funding	17	Austria, Belgium, Bulgaria, Cyprus, France, Germany, Hungary, Iceland, Italy, Luxembourg, , Norway, Poland, Portugal, Turkey, United Kingdom, Israel
R4.3	mostly 41-50 years old, mostly permanent contracts, research and teaching oriented, mostly middle level of autonomy, tenure-track option, block funding	11	Czech Republic, Finland, Ireland, Netherlands, Romania, Australia, Brazil, Japan, South Korea, USA
R4.4	temporary contracts, research oriented, mostly middle level of autonomy, yes and no tenure-track option, block funding	5	Croatia, Estonia, Macedonia, Serbia, China
R4.5	Missing information	6	Albania, Greece, Liechtenstein, Switzerland, Canada

3.4.2 Synthesis across all career stages

The analysis aimed at identifying common features and differences among countries with regard to employment conditions for researchers by career stages, to identify those factors which constitute the main dividing line between countries and to generate a perspective on the sequence, timing and likelihood of academic careers by covering all career stages.

The differences between countries within career stages have been outlined in section 3.4.1. In this section we now focus on the main dividing lines and the perspective on the employment conditions of academic careers. In all four career

⁴² The descriptive statistics for each cluster by variable used to classify countries are presented in the appendix 7.1.4.

stages, the type of contract and whether or not positions are provided with a tenure-track option are the dividing line between clusters.

As Sorensen (1992) pointed out, in academia it takes longer to qualify for a permanent position than is the case in other sectors, because the performance and productivity of a candidate are more difficult to measure and to judge. Following this idea, an early career researcher becomes a permanent member of the academic profession if he or she is evaluated to be a person who has the potential to be highly productive and a high performer in the future. However, countries differ in how they organize this evaluation process. But as a general rule, we assume that academics with a positive evaluation will secure a position with permanent contract and/or a tenure-track-option and that this position is not challenged by dependency on competitive funding.

From the perspective of an early career researcher, we would like to synthesize the results gained from our cluster analysis and group countries according to whether they offer positions with permanent contract, and/or a tenure-track-option and basic/block funding at a certain career stage. In the following we label these positions as positions with stable employment conditions.

As can be seen in *Table 3.4.5*, only very few countries offer stable employment conditions (as defined above) for early career researchers. These rather exceptional countries are Poland, Romania, Brazil, Bulgaria, Ireland, Norway, Portugal and Slovenia. Most countries in our sample offer stable working conditions for researchers from R3 career stage onwards. Only Estonia (tenure-track option in R1+2), Macedonia, Latvia and Russia do not offer stable employment conditions at any career stage. For two countries, Israel and Croatia, the information provided does not allow a categorization due to changing conditions along the career stages. For two countries, Liechtenstein and China, the required information allowing categorizing them, is missing.

Table 3.4.5: Career stage with stable employment conditions

Career stage with stable working conditions	Number of countries	Countries
R1	3	Poland, Romania, Brazil
R2	5	Bulgaria, Ireland, Norway, Portugal, Slovenia
R3	21	Albania, Austria, Belgium, Czech Republic, Denmark, Finland, France, Hungary, Iceland, Italy, Luxembourg, Netherlands, Serbia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Faroe Islands, Canada, USA
R4	10	Bosnia, Cyprus, Germany, Greece, Lithuania, Montenegro, Australia, Japan, Singapore, South Korea
No career stage provides stable working conditions	4	Estonia, Macedonia, Latvia, Russia
Miscellaneous	2	Israel, Croatia,
Missing information	2	Liechtenstein, China

In a next step, we analyze if the stage where stable employment conditions are granted for the first time can be related to other elements of an academic career:

- 1) We investigate whether the age at which the first permanent position is obtained is related to the career stage with stable employment conditions.
- 2) We discuss whether stable employment conditions are related to the stage when autonomy to pursue ones' own research agenda is reached.
- 3) We discuss whether early stable working conditions lead the HE sector to become more attractive when compared to other sectors.

3.4.2.1 Age when first permanent position is obtained

In terms of a life span perspective, the age when a permanent position can be obtained is important because a permanent position offers a certain degree of employment security that, for example, influences family planning. Thus we want to check whether permanent positions in earlier career stages are related to a younger age at these positions.

Indeed, our results show that the age and stage when first permanent position can be obtained are highly related (see *Table 3.4.6*): In countries where stable working conditions can be obtained at an earlier career stage, researchers tend to be younger when they obtain their first permanent position. This sounds like a trivial result, but it rejects hypotheses that career systems might have implemented longer qualification periods prior to the career stage with stable working conditions.

Table 3.4.6: Age range of first permanent position by career stage with stable working conditions

Career stage with working conditions	stage stable conditions	Age range of first permanent position															
		no rank with permanent contract		-30		31-35		36-40		41-45		46-50		Missing		Total	
		%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
R1		0	0	0	0	33	1	67	2	0	0	0	0	0	0	100	3
R2		0	0	20	1	40	2	20	1	0	0	0	0	20	1	100	5
R3		0	0	0	0	14	3	43	9	29	6	0	0	14	3	100	21
R4		0	0	0	0	0	0	10	1	10	1	60	6	20	2	100	10
No career stage		100	4	0	0	0	0	0	0	0	0	0	0	0	0	100	4
Missing information	infor-	25	1	0	0	0	0	25	1	25	1	0	0	25	1	100	4
Total		11	5	2	1	13	6	30	14	17	8	13	6	15	7	100	47

3.4.2.2 Researchers' autonomy to pursue their own research agenda

We assume that when researchers are granted a permanent position, they are also trusted to follow their own research agenda. The results show that this relationship can be found in most countries: In 31 out of the 47 countries researchers can pursue their own research agenda in career stage R2 or R3 (see *Table 3.4.7*). In the majority of these countries (18 out of 31) researchers have stable employment conditions at these career stages.

Furthermore, as shown above, pursuing one's own research agenda is detached from the highest career stage. Even in eight out of ten countries which offer stable employment conditions at only R4 career stage, researchers can more prominently pursue their own research agenda already at R2 or R3 career stage.

Table 3.4.7: Career stage with own research agenda by career stage with stable working conditions

Career stage with stable working conditions	Career stage with own research agenda													
	never		R1		R2		R3		R4		Missing		Total	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
R1	0	0	33	1	33	1	33	1	0	0	0	0	100	3
R2	0	0	20	1	20	1	40	2	0	0	20	1	100	5
R3	0	0	5	1	33	7	38	8	10	2	14	3	100	21
R4	0	0	10	1	30	3	40	4	20	2	0	0	100	10
No career stage	25	1	0	0	50	2	0	0	25	1	0	0	100	4
Missing information	0	0	25	1	25	1	25	1	0	0	25	1	100	4
Total	2	1	11	5	32	15	34	16	11	5	11	5	100	47

3.4.2.3 Attractiveness of the higher education sector compared to other sectors

In 20 out of the 47 countries analyzed, the higher education sector is as attractive for pursuing a researcher career as the other three sectors (see *Table 3.4.8*). In 18 countries the higher education sector is more attractive than the other sectors. In seven countries, the higher education sector is given a lower score in attractiveness than the average of the other sectors.

We are not able to relate the attractiveness of the higher education sector to the career stage when stable working conditions are secured. Neither do we find higher education more attractive in countries with stable employment conditions in R1 to R3 career stages, nor are stable employment conditions achieved only in R4 making the higher education sector less attractive. But, in the majority of countries where the R4 career stage offers stable working conditions, the higher education sector is more attractive than the other sectors. In addition, countries where the higher education sector is less attractive are characterized by those offering stable working conditions only in R3 positions.

Table 3.4.8: Attractiveness of higher education sector compared to other sectors by career stage with stable working conditions

Career stage with stable working conditions	Attractiveness of higher education compared to other sectors									
	less attractive		similarly attractive		more attractive		Missing		Total	
	%	N	%	N	%	N	%	N	%	N
R1	0	0	100	3	0	0	0	0	100	3
R2	0	0	80	4	20	1	0	0	100	5
R3	24	5	48	10	24	5	5	1	100	21
R4	20	2	10	1	70	7	0	0	100	10
No career stage	0	0	25	1	50	2	25	1	100	4
Missing information	0	0	25	1	75	3	0	0	100	4
Total	15	7	43	20	38	18	4	2	100	47

3.5 Country classification

We identified four clusters of countries with similar academic career systems shaping the sequence, timing and likelihood of academic careers (see *Table 3.5.1*)⁴³. 27 variables (see section 3.1.4) were used to generate these clusters so clusters characterization is rather complex. When a cluster is characterized in terms of one variable it is not necessarily that all countries share this attribute - but most of them do. A detailed descriptive statistics of all four clusters against the 27 variables chosen is presented in Appendix 7. Additionally, some of the variables chosen do not differentiate notably between the clusters⁴⁴. These variables are ignored in the cluster characterization. Our cluster characterizations are restricted to those attributes that differentiate them from the norm of all countries analyzed.

Our first cluster includes five countries. In contrast to the other clusters, academic career systems in these countries are characterized as follows:

⁴³ The methods used to generate the cluster solutions are described in section 3.1.4.

⁴⁴ These variables are: majority of researchers in R1+R2 (Topic ID 2.2), contracts in R1+R2 are shorter than 2 years (Topic ID 2.4), importance of performance in career advancement (Topic ID 2.7), source of funding of R3 positions (Topic ID 4.2) and vertical differentiation of HE sector (Topic ID 5.3).

- a career ladder based on temporary contracts,
- a high level of HEI autonomy,
- other institutions than universities are allowed to award doctorates,
- staff selection criteria are not predefined by law and
- national schemes encouraging international mobility are not in place although international mobility tends to be a prerequisite to pursue an academic career this cluster⁴⁵.

Our second cluster includes nine countries. In contrast to the other clusters, academic career systems in these countries are characterized as follows:

- independence with regard to the freedom to pursue one's own research agenda is reached at R3; and mainly R2 and R3 offer first permanent positions,
- low to medium level of social security,
- high to medium level of HEI autonomy combined with a medium level of university' autonomy to set employment conditions and
- strong disciplinary differences in career conditions.

Our third cluster includes 13 countries. In contrast to the other clusters, academic career systems in these countries are characterized as follows:

- independence with regard to the freedom to pursue one's own research agenda is reached at R2 and R3 and first permanent positions are granted in R1, R2 and R3,
- structured doctoral programs are mandatory and dominate doctoral training,
- a consecutive academic degree is needed and
- medium to high degree of HEI autonomy combined with a medium to low level of university' autonomy to set employment conditions.

Our fourth cluster includes 20 countries. In contrast to the other clusters, academic career systems in these countries are characterized as follows:

- international mobility is a prerequisite for an academic career, national schemes to promote international mobility exist,
- medium level of financial rewards are gained when climbing the academic career ladder (compared to the other clusters),
- high to medium level of social security,
- medium to low level of HEI autonomy combined with a low level of university autonomy to set employment conditions,
- intersectoral mobility is a prerequisite for certain careers and
- no significant disciplinary differences in careers.

Our country classification of academic career systems shows that the dividing lines presented do not work universally throughout the variables. A notable variation among the clusters is the degree of HEI autonomy in combination with the university autonomy to set employment conditions (clusters 2, 3 and 4). Another notable difference between the clusters are the predominant career stages at which an independence in terms of pursuing ones' own research agenda and employment security is reached (clusters 2 and 3). Clusters 2 and 4 are not only different in terms of the employment conditions and financial rewards offered to climb the career ladder, but also in terms of the level of HEI autonomy and the different impact of disciplinary conditions. Cluster 4 contains the largest group of

⁴⁵ In this cluster, academic careers are enhanced by international mobility in five countries.

countries with rather specific common characteristics. Cluster 4 could be marked as the standard cluster.

Do we expect the characteristics typical to the identified clusters to have a bearing on the sequence, timing and likelihood of academic careers? Our basic assumption was that yes, these differences have an impact on academic careers. Based on the empirical data we provide we now try to provide an answer to this question:

- Academic careers in countries in cluster 1 can be expected to be more diverse within a country because HEI have a high level of autonomy, other institutions than universities are allowed to award doctorates, international mobility is a prerequisite without supported by national schemes and a low level of employment security.
- Academic careers in countries of cluster 2 show high levels of independence at mid-term career. Progressing into the R3 career stage allows them to define their own research agenda independently and provides high employment security. Researchers' careers depend on disciplinary developments and institutional practices due to high HEI autonomy.
- Academic careers in countries of cluster 3 are characterized by early career independence. In these countries, academic independence and employment security tend to be granted earlier than in other countries.
- Academic careers in countries of cluster 4 might show a higher degree of mobility because international mobility is a prerequisite and is encouraged by national schemes; intersectoral mobility is also a prerequisite in certain areas. Researchers are exposed to more unified conditions within these countries due to a lower HEI autonomy and not very significant disciplinary differences.

The geographic locations of the countries classified in the clusters do not show any meaningful pattern (see Table 3.5.1).

Table 3.5.1: Academic career systems' cluster characterization⁴⁶

Cluster	Description	Number of countries	Countries
1	<ul style="list-style-type: none"> • Chair-model • No rank with permanent contract • International mobility is a prerequisite • Selection criteria not provided by law (in all countries of this cluster) • No national schemes to promote international mobility • Second degree is not needed • Universities and other institutions award doctorates • High degree of HEI autonomy 	5	Estonia, Luxembourg, Russia, China, Singapore
2	<ul style="list-style-type: none"> • Departmental-model • R3 as stage when an own research agenda can be pursued • R2+R3 stages may grant at first-time a permanent position • Reward of R3 position against R2 positions is 21% to 200% • Low to middle level of social security • Second degree is not needed • Positions are nationally and internationally advertised • High to middle level of HEI autonomy • Business and higher education sector dominate R&D activities • Middle level of autonomy of universities to set employment conditions • Strong disciplinary differences in career conditions 	9	Austria, Bosnia and Herzegovina, Denmark, Finland, Ireland, Montenegro, Switzerland, Australia, Canada
3	<ul style="list-style-type: none"> • Department-model • R2+R3 as stages when an own research agenda can be pursued • R1-R3 stages may grant at first-time a permanent position • Reward of R4 position against R1 positions is 100% or more • Structured doctoral programs are predominant (and mandatory) • Second degree is needed • Universities only award doctorates • Positions are nationally and internationally advertised • Middle to high degree of HEI autonomy • Both countries with country-wide selection procedures • Middle to low level of autonomy of universities to set employment conditions • Mix of countries with strong disciplinary and no strong disciplinary difference in career conditions 	13	Albania, Czech Republic, Macedonia, France, Iceland, Italy, Latvia, Liechtenstein, Norway, Romania, Spain, Sweden, United Kingdom

⁴⁶ Tables with the detailed descriptive statistics are presented in Appendix 7.2.

4	<ul style="list-style-type: none"> • Chair- and department-model • International mobility is a prerequisite • National schemes to promote international mobility are in place • Reward of R4 position against R3 positions is 21% to 200% • Reward of R3 position against R2 positions is up to 40% • Reward of R4 position against R1 positions is up to 200% • High to middle level of social security • Structured doctoral programs are predominant (but not necessarily mandatory) • Universities only award doctorates • Positions are nationally advertised • Middle to low level of HEI autonomy • Business sector dominates R&D activities • Intersectoral mobility a prerequisite of certain careers (35% of this cluster, but all countries with this feature are in this cluster) • Higher education is considerably less attractive compared to other sectors (25% of this cluster, but five out of seven countries with this feature are in this cluster) • Low level of autonomy of universities to set employment conditions • No disciplinary differences in careers 	20	<p>Belgium, Bulgaria, Croatia, Cyprus, Germany, Greece, Hungary, Lithuania, Netherlands, Poland, Portugal, Serbia, Slovenia, Turkey, Faroe Islands, Israel, Brazil, Japan, South Korea, USA</p>
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4 SUMMARY

This report provided the results of work packages 3, the case studies on working conditions and career paths of early career researchers (WP3) in selected countries of the MORE2 study on “support for continued data collection and analysis concerning mobility patterns and career paths of researchers”. It provides an overview of working conditions and career paths of early career researchers for the countries under investigation. The analysis is based on data and information provided by an extensive network of national experts. The data collection for WP3 was undertaken in close collaboration with WP4. A uniform set of three instruments was developed and used ensuring coherence of the information and data given by the experts. For the data collection for WP3, a template was used specifically, which was filled-in by all country correspondents.

The aim of the WP is to deliver comparable data on working conditions and career paths of early career researchers. Countries are compared regarding their R&D systems, career paths and working conditions. The analysis includes a classification of countries based on the characteristics of their academic career systems. The analysis is mainly based on data and information contained in the templates which was coded to create variable to be used in the statistical analysis. The classification of countries uses the four career stages model as a starting point, which was outlined by the European Commission (2011) in their communication “Towards a European Framework for Research Careers”. Additionally, we apply a framework developed by Kaulisch and Salerno (2009) to identify characteristics of academic careers systems that shape the sequence, timing and likelihood of researcher careers. The focus here is primarily on careers in the higher education sector.

The framework developed by Kaulisch and Salerno (2009) includes five sets of rules influencing the sequence, timing and likelihood of academic careers and which constitute an academic career system. These sets of rules are academics’ employment, credentials, intra-organizational practices, inter-organizational relationships and academic disciplines. For each of these sets of rules we constructed variables derived from the country correspondent template. In total, 27 variables are used to characterize an academic career system. Additionally, our comparative analyses of the four career stages are undertaken with six variables describing the employment conditions within a career stage.

The country classification is derived from a two-step-process. First, the (dis-) similarity of countries is calculated based on sequence analyses of the country characteristics. A string of values, per variable one value, is constructed as a sequence of a country. Second, cluster analyses are run to classify most similar countries together. The cluster solution suggested by a statistical test is contested by its meaningfulness. The solution is taken that meets both criteria.

4.1.1 Country comparison – the R&D system

Countries differ regarding their R&D intensity and the sectors where R&D is primarily conducted. In a number of EU countries, particularly southern and eastern European countries, research is performed to a higher extent in the public sector (higher education and government sector) than it is the case in United States, South Korea, China and Japan. The higher education sector is - if it comes to the share of GERD performed by the sector - more relevant especially in the EU-15 countries, compared to countries such as China, Russia, South Korea, Japan and the United States and most EU-12 countries. In general, the share of researchers employed by the sectors is in line with sectors’ share of GERD. Thus, European countries tend to employ more researchers in the public sector compared to Chi-

na, Japan, South Korea and the United States. The share of female researchers is higher in countries with comparable low GERD (as % of GDP). In addition, the share of female researchers is higher in the public sector than in the business enterprise sector.

The country correspondents were requested to judge the overall and long-term attractiveness of the four sectors sector for pursuing a research career⁴⁷. The share of countries where the attractiveness of the higher education sector was assessed as “good” or even “excellent” exceeds respective assessments for the other sectors. Still, in the majority of countries the attractiveness of the government sector and the business enterprise sector for pursuing a researcher’s career was also rated “good” or “excellent”.

In most countries, higher education institutions have a high degree of autonomy regarding academic, organizational and staffing issues. What differs is the situation regarding financial autonomy - here the higher education institutions face more limitations. No regional differences regarding the degree of autonomy of higher education were found; meaning the degree of autonomy is not particularly high or low in the countries of certain (world) regions.

In most countries, higher education institutions pursue research and teaching. Teaching-only institutions can be found in very few countries. With regard to the institutions’ organization, we find the department model being implemented in the majority of HEI. Universities are, in most countries, the only institutions awarding doctorates and a degree beyond the doctorate is not mandatory. While structured doctoral training is not necessarily mandatory it is meanwhile the predominant way to gain a PhD in the majority of countries. While there are some differences with regard to the age when a PhD is typically awarded, in the majority of countries the doctorate is earned before the 35th birthday.

4.1.2 Career paths and working conditions – general description

Throughout the career stages most positions are funded by block funding. In most countries, researchers start their career (R1) on temporary contracts. The majority of positions are also based on temporary contracts at the R2 career stage. Only a few countries offer permanent positions already at this career stage. The situation only changes when moving to career stage R3: here the majority of positions grant permanent contracts. With a career progression to the R3 stage it is not only the typical type of contract which changes but also the length of the temporary contracts. Temporary contracts are more likely to extend over a longer period (>4 years) at higher career stages than in earlier career stages. Tenure-track options are available to the majority of positions in career stage R3 and R4. Furthermore, not surprisingly, career progression is also characterized by increasing researcher autonomy. Significant gains in autonomy take place when researchers move from R2 to R3 and from R3 to R4 career stage.

The countries under investigation are rather similar with regard to the age at which a specific career stage can typically be obtained. In most countries, R1-positions are obtained when researchers are younger than 30 years of age. In most countries (with information available), R2-positions are obtained before the 36th birthday and R3-positions before the 41st birthday. In the vast majority of countries (with information available), R4-positions are obtained before the 51st birthday including a large group of countries in which these positions are obtained already before the 46th birthday.

⁴⁷ Please note that these assessments are the view of the individual country correspondents. No attempt has been made to harmonize the assessments across countries.

In most countries, positions are advertised nationally and rarely worldwide, and career progression depends on the performance of the researcher and international mobility is a prerequisite for a career or at least in certain areas. In terms of schemes to support and enhance international mobility, the countries are split in two groups of the same size: one group has implemented national schemes whereas the other group does not have them but rather relies on the European initiatives.

4.1.3 Results of the country classification for each career stage

Our aim for this section is to group countries around their characteristics per career stage, to identify factors that present the main dividing line between countries and to generate a perspective on the sequence, timing and likelihood of academic careers. In R1-, R2- and R4-career stages we group the countries into five clusters and in R3 career stage we find a four cluster solution. In each career stage one cluster includes all those countries where most of the information is missing.

In all career stages except R3 we identify a general description of the respective career stage into which most countries can be grouped. This result suggests that career stages are rather homogenous within the countries observed. Additionally, countries from certain (world) regions are not necessarily found in the same clusters per career stage. Nonetheless, some groups of countries are classified into the same clusters.

- Characterization of R1 career stage in most countries: young researchers at the age of 30 years or even younger, they are employed based on block-funded temporary contracts and they have only a low level of autonomy and no tenure-track option.
- Characterization of R2 career stage in most countries: mainly researchers in their early 30s, who are employed on block-funded temporary contracts, engaged in both teaching and research tasks, having a low level of autonomy.
- In R3 career stage, two groups of countries (Cluster R3.1 vs. R3.3 + R3.4) are divided in terms of type of contract, research/teaching nexus and level of researchers' autonomy.
- Characterization of R4 career stage in most countries: researchers who obtain these positions in their 40s, are employed on block-funded permanent contracts, undertake both teaching and research tasks and have a high level of autonomy.

In R1 career stage, we find that Southern European countries tend to employ researchers for research tasks only (an exception is Greece). In R2 career stage, we show that East-Asian countries are grouped into one cluster (an exception is South Korea). In R3 career stage, we show that the cluster R3.1 with temporary contracts, block-funding, research or teaching and tenure-track option (yes and no) is dominated by countries from the Former Yugoslav Republic (without Slovenia), other Eastern European countries such as Russia, Albania and Estonia, three of the four East-Asian countries and Israel and United Kingdom. The other R3.3+R3.4 clusters is common among Northern, Western and Central European countries plus Bulgaria, hence most EU-27 countries are in these clusters. In R4 cluster, we cannot show any notable concentration of regions in one cluster or two clusters with similar pattern.

In all four career stages the main dividing line between countries are the type of contract and whether or not a position was provided with a tenure-track option.

We conclude that stable employment conditions are reached in most countries at the latest, at R3 career stage. Only Estonia, Macedonia, Latvia and Russia are reported to not offer stable employment conditions at any career stage. Further analyses show that:

- in countries where stable employment conditions can be obtained at earlier career stage, researchers tend to be younger when they obtain their first permanent position;
- in most countries, researchers having positions with stable employment conditions are trusted to pursue their own research agenda and
- the attractiveness of the higher education sector compared to other sectors is not higher if countries provide stable employment conditions at an earlier career stage.

4.1.4 Results of the country classification of academic career systems

We identified four different groups of countries with similar academic career systems. Our country classification of academic career systems shows that the dividing lines between the groups of countries are subject to only certain parts of our variables chosen. Clusters 2 and 3 are different in terms of the career stage at which a certain level of research independence is reached. In Cluster 2 research independence is reached at R3 career stage and, in most cases, this involves stable working conditions. Countries in Cluster 3 tend to grant research independence earlier to their academics. Cluster 1 is different in terms of HEI autonomy, international mobility and type of contract. On the other side, Cluster 4 includes the largest group of countries that do, on aggregate, show rather specific common characteristics compared to the others. Cluster 4 could be marked as the standard cluster. The geographic location of the countries classified in the clusters does not show any meaningful pattern.

Whereas our country classification of each career stage shows rather homogenous characteristics for each career stage, our country classification of academic career systems suggests diversity of systems worldwide – although limited to certain sets of rules. A next step in the analysis should investigate whether we can identify relationships between academic career systems and characteristics of career stages.

4.2 Methodology limitations, caveats and lessons learned for future studies

Finally, we discuss the lessons learned during the inception phase of preparing the questionnaires and templates, the data collection and the preparation of this report. First of all we would like to highlight the extensive workload required to collect data for about 50 countries via a network of country experts. In order to collect valid and reliable data, experts have to be closely accompanied during the data collection process. Closer contact with the experts and excellent network management lead to the best results. This required checks of the data during the field phase and frequent follow up calls whenever the collected data are questionable or ambiguous. We therefore highlight the importance of setting up a well-functioning network management system in order to guarantee the success of such a project.

Furthermore, in this project it was possible only to assign one expert per country. Making use of more than one expert per country would be preferable in order to improve the quality and the validity of the data. Personal biases in the perception

of qualitative information can be better avoided and data gaps can be filled more easily in case one of the experts in charge does not have access to required data or is not able to fill in the needed information for other reasons. Given the focus of this study in surveying a large set of countries (i.e. requiring a large number of experts) and including both the academic and non-academic sector (i.e. increasing the workload for the experts), and considering the budget constraints, it was not possible to make use of more than one expert per country.

Second, the collection of a huge amount of data - as in this study - requires time consuming data cleaning before it is possible to start the analysis. The quality of data cleaning is crucial in order to obtain plausible results. The amount of time required to clean the data is difficult to foresee and was critical in this study.

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6 COUNTRY FICHES

Country fiches were made available via Dropbox. They can be downloaded via:

7 APPENDIX: DESCRIPTIVE STATISTICS FOR CLUSTER SOLUTIONS IN SECTION 3.4 AND 3.5

7.1 Descriptive statistics for cluster solutions per career stage (section 3.4)

7.1.1 R1 career stage: Statistics on cluster solution

Table 7.1.1: Normal age when position in career stage R1 is obtained by country clusters in career stage R1

Country clusters in career stage R1	Normal age when position in career stage R1 is obtained											
	-30	-30	31-35	31-35	36-40	36-40	41-45	41-45	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N	%	N	%	N
1	53	10	37	7	0	0	0	0	11	2	100	19
2	64	9	29	4	0	0	0	0	7	1	100	14
3	100	6	0	0	0	0	0	0	0	0	100	6
4	0	0	0	0	0	0	0	0	100	5	100	5
5	0	0	0	0	33	1	67	2	0	0	100	3
Total	53	25	23	11	2	1	4	2	17	8	100	47

Table 7.1.2: Type of contract in career stage R1 by Country clusters in career stage R1

Country clusters in career stage R1	Type of contract in career stage R1						Missing	Missing	Total	Total
	only positions with temporary contracts	only positions with temporary contracts	only positions with permanent contracts	only positions with permanent contracts	Missing	Missing				
	%	N	%	N	%	N	%	N		
1	95	18	5	1	0	0	100	19		
2	100	14	0	0	0	0	100	14		
3	100	6	0	0	0	0	100	6		
4	80	4	0	0	20	1	100	5		
5	0	0	100	3	0	0	100	3		
Total	89	42	9	4	2	1	100	47		

Table 7.1.3: Research/teaching nexus: R1 positions by Country clusters in career stage R1

Country clusters in career stage R1	Research/teaching nexus: R1 positions											
	Teaching-oriented	Teaching-oriented	Research-oriented	Research-oriented	Research and teaching oriented	Research and teaching oriented	Research or teaching in positions	Research or teaching in positions	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N	%	N	%	N
1	21	4	0	0	58	11	21	4	0	0	100	19
2	0	0	100	14	0	0	0	0	0	0	100	14
3	17	1	33	2	17	1	17	1	17	1	100	6
4	0	0	40	2	0	0	0	0	60	3	100	5
5	0	0	0	0	100	3	0	0	0	0	100	3
Total	11	5	38	18	32	15	11	5	9	4	100	47

Table 7.1.4: Level of researchers' autonomy in R1 by Country clusters in career stage R1

Country clusters in career stage R1	Level of researchers' autonomy in R1							
	low level of autonomy	low level of autonomy	middle level of autonomy	middle level of autonomy	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N
1	100	19	0	0	0	0	100	19
2	86	12	14	2	0	0	100	14
3	83	5	0	0	17	1	100	6
4	60	3	0	0	40	2	100	5
5	67	2	33	1	0	0	100	3
Total	87	41	6	3	6	3	100	47

Table 7.1.5: Type of funding: Majority of R1 positions by Country clusters in career stage R1

Country clusters in career stage R1	Type of funding: Majority of R1 positions												Total	Total
	majority funded by block funding	majority funded by block funding	majority funded by competitive funding	majority funded by competitive funding	balance between and competitive funding	balance between block and com- petitive funding	block competitive funding	or	block competitive funding	or	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	47	9	11	2	26	5	0	0	16	3	100	19		
2	57	8	14	2	14	2	7	1	7	1	100	14		
3	83	5	0	0	0	0	17	1	0	0	100	6		
4	40	2	0	0	0	0	0	0	60	3	100	5		
5	100	3	0	0	0	0	0	0	0	0	100	3		
Total	57	27	9	4	15	7	4	2	15	7	100	47		

Table 7.1.6: Tenure-track option available in R1 by Country clusters in career stage R1

Country clusters in career stage R1	Tenure-track option available in R1								Total	Total
	No	No	Yes	Yes	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N	%	N
1	100	19	0	0	0	0	100	19		
2	100	14	0	0	0	0	100	14		
3	17	1	83	5	0	0	100	6		
4	80	4	0	0	20	1	100	5		
5	0	0	100	3	0	0	100	3		
Total	81	38	17	8	2	1	100	47		

7.1.2 R2 career stage: Statistics on cluster solution

Table 7.1.7: Normal age when position in career stage R2 is obtained by Country clusters in career stage R2

Country clusters in career stage R2	Normal age when position in career stage R2 is obtained												Total	Total
	-30	-30	31-35	31-35	36-40	36-40	41-45	41-45	46-50	46-50	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	0	0	63	10	6	1	0	0	0	0	31	5	100	16
2	8	1	54	7	31	4	0	0	0	0	8	1	100	13
3	29	2	0	0	71	5	0	0	0	0	0	0	100	7
4	38	3	13	1	13	1	13	1	13	1	13	1	100	8
5	0	0	0	0	0	0	0	0	0	0	100	3	100	3
Total	13	6	38	18	23	11	2	1	2	1	21	10	100	47

Table 7.1.8: Type of contract in career stage R2 by Country clusters in career stage R2

Country clusters in career stage R2	Type of contract in career stage R2										Missing	Missing	Total	Total
	only temporary contracts	positions with temporary contracts	only temporary contracts	positions with temporary and permanent contracts	positions with both temporary and permanent contracts	only permanent contracts	positions with permanent contracts	only permanent contracts	positions with permanent contracts	Missing				
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	100	16	0	0	0	0	0	0	0	0	0	0	100	16
2	77	10	0	0	23	3	0	0	0	0	0	0	100	13
3	100	7	0	0	0	0	0	0	0	0	0	0	100	7
4	25	2	25	2	50	4	0	0	0	0	0	0	100	8
5	0	0	0	0	0	0	0	0	100	3	3	3	100	3
Total	74	35	4	2	15	7	6	3	6	3	100	47	100	47

Table 7.1.9: Research/teaching nexus: R2 positions by Country clusters in career stage R2

Country clusters in career stage R2	Research/teaching nexus: R2 positions										Total	Total
	Teaching-oriented	Teaching-oriented	Research-oriented	Research-oriented	Research and teaching oriented	Research and teaching oriented	Research or teaching in positions	Research or teaching in positions	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N		
1	13	2	25	4	44	7	0	0	19	3	100	16
2	8	1	8	1	85	11	0	0	0	0	100	13
3	14	1	57	4	14	1	14	1	0	0	100	7
4	0	0	38	3	50	4	13	1	0	0	100	8
5	0	0	0	0	0	0	0	0	100	3	100	3
Total	9	4	26	12	49	23	4	2	13	6	100	47

Table 7.1.10: Level of researchers' autonomy in R2 by Country clusters in career stage R2

Country clusters in career stage R2	Level of researchers' autonomy in R2								Missing	Missing	Total	Total
	low level of autonomy	low level of autonomy	middle level of autonomy	middle level of autonomy	high level of autonomy	high level of autonomy	Missing	Missing				
	%	N	%	N	%	N	%	N				
1	63	10	31	5	0	0	6	1	100	16		
2	77	10	8	1	15	2	0	0	100	13		
3	71	5	29	2	0	0	0	0	100	7		
4	63	5	38	3	0	0	0	0	100	8		
5	0	0	0	0	0	0	100	3	100	3		
Total	64	30	23	11	4	2	9	4	100	47		

Table 7.1.11: Type of funding: Majority of R2 positions by Country clusters in career stage R2

Country clusters in career stage R2	Type of funding: Majority of R2 positions												Total	Total
	majority funded by block funding	majority funded by block funding	majority funded by competitive funding	majority funded by competitive funding	balance between and competitive funding	balance between and competitive funding	block competitive funding	or	block competitive funding	or	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	56	9	0	0	25	4	0	0	0	19	3	100	16	
2	85	11	0	0	8	1	8	1	0	0	0	100	13	
3	43	3	29	2	0	0	14	1	14	1	1	100	7	
4	38	3	38	3	13	1	13	1	0	0	0	100	8	
5	0	0	0	0	0	0	0	0	100	3	100	3		
Total	55	26	11	5	13	6	6	3	15	7	100	47		

Table 7.1.12: Tenure-track option available in R2 by Country clusters in career stage R2

Country clusters in career stage R2	Tenure-track option available in R2								Total	Total
	No	No	Yes	Yes	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N	%	N
1	94	15	6	1	0	0	100	16		
2	23	3	77	10	0	0	100	13		
3	100	7	0	0	0	0	100	7		
4	0	0	100	8	0	0	100	8		
5	0	0	0	0	100	3	100	3		
Total	53	25	40	19	6	3	100	47		

7.1.3 R3 career stage: Statistics on cluster solution

Table 7.1.13: Normal age when position in career stage R3 is obtained by Country clusters in career stage R3

Country clusters in career stage R3	Normal age when position in career stage R3 is obtained												Total	Total
	31-35	31-35	36-40	36-40	41-45	41-45	46-50	46-50	51-55	51-55	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	0	0	40	6	13	2	7	1	0	0	40	6	100	15
2	0	0	0	0	0	0	0	0	0	0	100	4	100	4
3	25	4	56	9	13	2	0	0	6	1	0	0	100	16
4	8	1	0	0	67	8	0	0	0	0	25	3	100	12
Total	11	5	32	15	26	12	2	1	2	1	28	13	100	47

Table 7.1.14: Type of contract in career stage R3 by Country clusters in career stage R3

Country clusters in career stage R3	Type of contract in career stage R3								Missing	Missing	Total	Total
	only positions with temporary contracts	only positions with temporary contracts	positions both with temporary and permanent contracts	positions both with temporary and permanent contracts	only positions with permanent contracts	only positions with permanent contracts	positions both with temporary and permanent contracts	positions both with temporary and permanent contracts				
	%	N	%	N	%	N	%	N	%	N	%	N
1	60	9	13	2	27	4	0	0	100	15		
2	25	1	0	0	25	1	50	2	100	4		
3	31	5	25	4	44	7	0	0	100	16		
4	0	0	0	0	100	12	0	0	100	12		
Total	32	15	13	6	51	24	4	2	100	47		

Table 7.1.15: Research/teaching nexus: R3 positions by Country clusters in career stage R3

Country clusters in career stage R3	Research/teaching nexus: R3 positions										Total	Total
	Teaching-oriented	Teaching-oriented	Research-oriented	Research-oriented	Research and teaching oriented	Research and teaching oriented	Research or teaching in positions	Research or teaching in positions	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N		
1	33	5	40	6	20	3	0	0	7	1	100	15
2	0	0	0	0	0	0	0	0	100	4	100	4
3	0	0	13	2	69	11	19	3	0	0	100	16
4	0	0	0	0	92	11	0	0	8	1	100	12
Total	11	5	17	8	53	25	6	3	13	6	100	47

Table 7.1.16: Level of researchers' autonomy in R3 by Country clusters in career stage R3

Country clusters in career stage R3	Level of researchers' autonomy in R3										Total	Total
	low level of autonomy	low level of autonomy	middle level of autonomy	middle level of autonomy	high level of autonomy	high level of autonomy	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N	%	N		
1	73	11	13	2	7	1	7	1	100	15		
2	0	0	25	1	0	0	75	3	100	4		
3	6	1	63	10	31	5	0	0	100	16		
4	8	1	42	5	50	6	0	0	100	12		
Total	28	13	38	18	26	12	9	4	100	47		

Table 7.1.17: Type of funding: Majority of R3 positions by Country clusters in career stage R3

Country clusters in career stage R3	Type of funding: Majority of R3 positions												Total	Total
	majority funded by funding	majority funded by block funding	majority funded by competitive funding	majority funded by competitive funding	balance between and competitive funding	balance between block and competitive funding	block competitive funding	or	block competitive funding	or	Missing	Missing		
	%	N	%	N	%	N	%		N	%	N	%		
1	87	13	7	1	0	0	0	0	0	0	7	1	100	15
2	25	1	0	0	0	0	0	0	0	0	75	3	100	4
3	50	8	6	1	25	4	13	2	2	6	1	100	16	
4	100	12	0	0	0	0	0	0	0	0	0	0	100	12
Total	72	34	4	2	9	4	4	2	2	11	5	100	47	

Table 7.1.18: Tenure-track option available in R3 by Country clusters in career stage R3

Country clusters in career stage R3	Tenure-track option available in R3								Total	Total
	No	No	Yes	Yes	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N		
1	47	7	53	8	0	0	100	15		
2	25	1	25	1	50	2	100	4		
3	13	2	88	14	0	0	100	16		
4	33	4	67	8	0	0	100	12		
Total	30	14	66	31	4	2	100	47		

7.1.4 R4 career stage: Statistics on cluster solution

Table 7.1.19: Normal age when position in career stage R4 is obtained by Country clusters in career stage R4

Country clusters in career stage R4	Normal age when position in career stage R4 is obtained												Total	Total
	36-40	36-40	41-45	41-45	46-50	46-50	51-55	51-55	56-60	56-60	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	0	0	0	0	88	7	0	0	13	1	0	0	100	8
2	6	1	35	6	6	1	24	4	0	0	29	5	100	17
3	0	0	27	3	64	7	0	0	9	1	0	0	100	11
4	20	1	20	1	0	0	20	1	0	0	40	2	100	5
5	0	0	0	0	0	0	0	0	0	0	100	6	100	6
Total	4	2	21	10	32	15	11	5	4	2	28	13	100	47

Table 7.1.20: Type of contract in career stage R4 by Country clusters in career stage R4

Country clusters in career stage R4	Type of contract in career stage R4										Missing	Missing	Total	Total
	only temporary contracts	positions with temporary contracts	only temporary contracts	positions with temporary and permanent contracts	positions with both temporary and permanent contracts	only permanent contracts	positions with permanent contracts	only permanent contracts	positions with permanent contracts	Missing				
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	25	2	0	0	75	6	0	0	0	0	100	8		
2	6	1	0	0	94	16	0	0	0	0	100	17		
3	0	0	18	2	82	9	0	0	0	0	100	11		
4	80	4	20	1	0	0	0	0	0	0	100	5		
5	0	0	0	0	33	2	67	4	0	0	100	6		
Total	15	7	6	3	70	33	9	4	100	47				

Table 7.1.21: Research/teaching nexus: R4 positions by Country clusters in career stage R4

Research/teaching nexus: R4 positions										
Country clusters in career stage R4	Teaching-oriented		Research-oriented		Research and teaching oriented		Missing		Total	Total
	%	N	%	N	%	N	%	N	%	N
1	25	2	13	1	63	5	0	0	100	8
2	6	1	6	1	82	14	6	1	100	17
3	9	1	0	0	91	10	0	0	100	11
4	20	1	40	2	0	0	40	2	100	5
5	0	0	0	0	0	0	100	6	100	6
Total	11	5	9	4	62	29	19	9	100	47

Table 7.1.22: Level of researchers' autonomy in R4 by Country clusters in career stage R4

Level of researchers' autonomy in R4										
Country clusters in career stage R4	low level of autonomy		middle level of autonomy		high level of autonomy		Missing		Total	Total
	%	N	%	N	%	N	%	N	%	N
1	13	1	38	3	50	4	0	0	100	8
2	6	1	12	2	82	14	0	0	100	17
3	0	0	73	8	27	3	0	0	100	11
4	0	0	60	3	20	1	20	1	100	5
5	0	0	17	1	0	0	83	5	100	6
Total	4	2	36	17	47	22	13	6	100	47

Table 7.1.23: Type of funding: Majority of R4 positions by Country clusters in career stage R4

Country clusters in career stage R4	Type of funding: Majority of R4 positions								Missing %	Missing N	Total %	Total N
	majority funded by block funding		majority funded by block funding		majority funded by competitive funding		balance between block and competitive funding					
	%	N	%	N	%	N	%	N				
1	88	7	0	0	13	1	0	0	0	100	8	
2	94	16	0	0	0	0	0	6	1	100	17	
3	73	8	9	1	18	2	0	0	0	100	11	
4	80	4	0	0	0	0	0	20	1	100	5	
5	17	1	0	0	0	0	0	83	5	100	6	
Total	77	36	2	1	6	3	15	15	7	100	47	

Table 7.1.24: Tenure-track option available in R4 by Country clusters in career stage R4

Country clusters in career stage R4	Tenure-track option available in R4						Missing %	Missing N	Total %	Total N
	No		Yes		Yes					
	%	N	%	N	%	N				
1	88	7	13	1	0	0	0	100	8	
2	29	5	71	12	0	0	0	100	17	
3	0	0	100	11	0	0	0	100	11	
4	60	3	40	2	0	0	0	100	5	
5	17	1	17	1	67	4	4	100	6	
Total	34	16	57	27	9	4	4	100	47	

7.2 Descriptive statistics for the country classification of academic career systems (section 3.5)

7.2.1 Academics' employment

Table 7.2.1: Vertical differentiation of staff structure by academic career systems' country clusters

Academic systems' clusters	career country	Vertical differentiation of staff structure							
		chair-model		department-model		Missing		Total	Total
		%	N	%	N	%	N	%	N
1		80	4	0	0	20	1	100	5
2		22	2	78	7	0	0	100	9
3		0	0	92	12	8	1	100	13
4		40	8	50	10	10	2	100	20
Total		30	14	62	29	9	4	100	47

Table 7.2.2: Majority of researchers in R1+R2 by academic career systems' country clusters

Academic career systems' country clusters	Majority of researchers in R1+R2							
	Most researchers in R3+R4	Most researchers in R3+R4	Most researchers in R1+R2	Most researchers in R1+R2	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N
1	20	1	40	2	40	2	100	5
2	33	3	56	5	11	1	100	9
3	15	2	23	3	62	8	100	13
4	25	5	45	9	30	6	100	20
Total	23	11	40	19	36	17	100	47

Table 7.2.3: Career stage with own research agenda by academic career systems' country clusters

Academic career systems' country clusters	Career stage with own research agenda												Total	Total
	never	never	R1	R1	R2	R2	R3	R3	R4	R4	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N		
1	20	1	0	0	20	1	40	2	20	1	0	0	100	5
2	0	0	0	0	0	0	89	8	11	1	0	0	100	9
3	0	0	8	1	46	6	23	3	0	0	23	3	100	13
4	0	0	20	4	40	8	15	3	15	3	10	2	100	20
Total	2	1	11	5	32	15	34	16	11	5	11	5	100	47

Table 7.2.4: All Contracts in R1+R2 positions are shorter than 2 years by academic career systems' country clusters

Academic career systems' country clusters	All Contracts in R1+R2 positions are shorter than 2 years								Total	Total
	No	No	Yes	Yes	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N		
1	80	4	20	1	0	0	100	5		
2	89	8	11	1	0	0	100	9		
3	92	12	0	0	8	1	100	13		
4	80	16	15	3	5	1	100	20		
Total	85	40	11	5	4	2	100	47		

Table 7.2.5: Age range of first permanent position by academic career systems' country clusters

Academic career systems' country clusters	Age range of first permanent position														Total	Total
	no rank with permanent contract	with permanent contract	-30	-30	31-35	31-35	36-40	36-40	41-45	41-45	46-50	46-50	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	60	3	0	0	0	0	0	0	20	1	0	0	20	1	100	5
2	0	0	11	1	11	1	22	2	22	2	33	3	0	0	100	9
3	15	2	0	0	8	1	46	6	8	1	0	0	23	3	100	13
4	0	0	0	0	20	4	30	6	20	4	15	3	15	3	100	20
Total	11	5	2	1	13	6	30	14	17	8	13	6	15	7	100	47

Table 7.2.6: Rank at which first permanent position can be obtained by academic career systems' country clusters

Academic career systems' country clusters	Rank at which first permanent position can be obtained												Total	Total
	no rank with permanent contract	with permanent contract	R1	R1	R2	R2	R3	R3	R4	R4	Total	Total		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	60	3	0	0	0	0	20	1	20	1	100	5		
2	0	0	0	0	11	1	56	5	33	3	100	9		
3	15	2	8	1	8	1	69	9	0	0	100	13		
4	0	0	15	3	15	3	40	8	30	6	100	20		
Total	11	5	9	4	11	5	49	23	21	10	100	47		

Table 7.2.7: Importance of performance in career advancement (most common among positions) by academic career systems' country clusters

Academic career systems' country clusters	Importance of performance in career advancement (most common among positions)												Total %	Total N		
	no performance-orientation	perfor- mance-orientation	no perfor- mance-orientation	perfor- mance-orientation	some perfor- mance-orientation	perfor- mance-orientation	some perfor- mance-orientation	perfor- mance-orientation	performance orientation	performance orientation	categories are equally distributed among positions	are dis-tributed positions			categories are equally distributed among positions	are dis-tributed positions
	%	N	%	N	%	N	%	N	%	N	%	N	%	N		
1	60	3	0	0	22	2	67	6	0	0	11	1	100	5		
2	0	0	22	2	67	6	67	6	0	0	11	1	100	9		
3	15	2	23	3	62	8	62	8	0	0	10	2	100	13		
4	10	2	15	3	65	13	65	13	10	2	10	2	100	20		
Total	15	7	17	8	62	29	62	29	6	3	6	3	100	47		

Table 7.2.8: Selection criteria provided by law by academic career systems' country clusters

Academic career systems' country clusters	Selection criteria provided by law										Total %	Total N
	selection criteria not in law	criteria	selection criteria not in law	criteria	selection criteria by law	criteria	selection criteria by law	criteria	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N	%	N
1	100	5	0	0	0	0	0	0	0	0	100	5
2	56	5	22	2	22	2	22	2	22	2	100	9
3	62	8	23	3	23	3	15	2	15	2	100	13
4	50	10	25	5	25	5	25	5	25	5	100	20
Total	60	28	21	10	21	10	19	9	19	9	100	47

Table 7.2.9: International mobility as prerequisite of an academic career by academic career systems' country clusters

Academic career systems' country clusters	International mobility a prerequisite of an academic career?									
	no		in certain areas only		yes		Missing		Total	Total
	%	N	%	N	%	N	%	N	%	N
1	40	2	20	1	40	2	0	0	100	5
2	11	1	11	1	33	3	44	4	100	9
3	31	4	15	2	23	3	31	4	100	13
4	30	6	20	4	40	8	10	2	100	20
Total	28	13	17	8	34	16	21	10	100	47

Table 7.2.10: Schemes to enhance international mobility by academic career systems' country clusters

Academic career systems' country clusters	Schemes to enhance international mobility								Total	Total
	None/only European		None/only Euro-pean		National initiatives		Missing		Total	Total
	%	N	%	N	%	N	%	N	%	N
1	80	4	20	1	0	0	0	0	100	5
2	56	5	44	4	0	0	0	0	100	9
3	46	6	31	4	23	3	3	3	100	13
4	35	7	60	12	5	1	1	1	100	20
Total	47	22	45	21	9	4	4	4	100	47

Table 7.2.11: Financial reward of R4 against R3 position by academic career systems' country clusters

Academic career systems' country clusters	Financial reward of R4 against R3 position										Total	Total
	missing	missing	Up to 20% more income in R4		21-40% more income in R4		41-200% more income in R4		41-200% more income in R4			
	%	N	%	N	%	N	%	N	%	N		
1	60	3	0	0	40	2	0	0	100	5		
2	33	3	11	1	44	4	11	1	100	9		
3	31	4	0	0	31	4	38	5	100	13		
4	0	0	40	8	35	7	25	5	100	20		
Total	21	10	19	9	36	17	23	11	100	47		

Table 7.2.12: Financial reward of R3 against R2 position by academic career systems' country clusters

Academic career systems' country clusters	Financial reward of R3 against R2 position										Total	Total
	missing	missing	Up to 20% more income in R3		21-40% more income in R3		41-200% more income in R3		41-200% more income in R3			
	%	N	%	N	%	N	%	N	%	N		
1	60	3	20	1	20	1	0	0	100	5		
2	11	1	11	1	56	5	22	2	100	9		
3	31	4	15	2	31	4	23	3	100	13		
4	5	1	60	12	25	5	10	2	100	20		
Total	19	9	34	16	32	15	15	7	100	47		

Table 7.2.13: Financial reward of R4 against R1 position by academic career systems' country clusters

Academic career systems' country clusters	Financial reward of R4 against R1 position										Total	Total
	missing	missing	Up to 100% more income in R4		100-200% more income in R4		201 or more income in R4		201 or more income in R4			
	%	N	%	N	%	N	%	N	%	N		
1	100	5	0	0	0	0	0	0	100	5		
2	56	5	33	3	0	0	11	1	100	9		
3	15	2	23	3	38	5	23	3	100	13		
4	0	0	45	9	35	7	20	4	100	20		
Total	26	12	32	15	26	12	17	8	100	47		

Table 7.2.14: Social security level by academic career systems' country clusters

Academic career systems' country clusters	Social security level										Total	Total
	low level of social security	low level of social security	middle level of social security	middle level of social security	high level of social security	high level of social security	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N	%	N		
1	40	2	0	0	60	3	100	5	40	2		
2	56	5	22	2	22	2	100	9	56	5		
3	31	4	31	4	38	5	100	13	31	4		
4	20	4	30	6	50	10	100	20	20	4		
Total	32	15	26	12	43	20	100	47	32	15		

7.2.2 Credentials

Table 7.2.15: Characteristics of doctoral training by academic career systems' country clusters

Academic career systems' country clusters	Characteristics of doctoral training										Total	Total
	Structured doctoral programs not predominant and not mandatory	Structured doctoral programs not predominant and not mandatory	Structured doctoral programs not predominant but mandatory	Structured doctoral programs not predominant but mandatory	Structured doctoral programs predominant but not mandatory	Structured doctoral programs predominant but not mandatory	Structured doctoral programs predominant and mandatory	Structured doctoral programs predominant and mandatory	Missing	Missing		
	%	N	%	N	%	N	%	N	%	N		
1	60	3	0	0	40	2	100	5	60	3	0	0
2	44	4	33	3	22	2	100	9	44	4	33	3
3	23	3	23	3	54	7	100	13	23	3	23	3
4	30	6	25	5	45	9	100	20	30	6	25	5
Total	34	16	23	11	43	20	100	47	34	16	23	11

Table 7.2.16: Second degree needed by academic career systems' country clusters

Academic career systems' country clusters	Second degree needed									
	no	no	no, but tradition	no, but tradition	yes	yes	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N	%	N
1	80	4	0	0	20	1	0	0	100	5
2	78	7	11	1	11	1	0	0	100	9
3	46	6	8	1	46	6	0	0	100	13
4	60	12	10	2	25	5	5	1	100	20
Total	62	29	9	4	28	13	2	1	100	47

Table 7.2.17: Doctorate awarding institution by academic career systems' country clusters

Academic career systems' country clusters	Doctorate awarding institution								Total	Total
	Universities plus others	Universities plus others	Universities	Universities	Missing	Missing	Total	Total		
	%	N	%	N	%	N	%	N		
1	60	3	20	1	20	1	100	5		
2	44	4	56	5	0	0	100	9		
3	8	1	77	10	15	2	100	13		
4	10	2	80	16	10	2	100	20		
Total	21	10	68	32	11	5	100	47		

7.2.3 Intra-organizational practices

Table 7.2.18: Site where positions are mainly advertised by academic career systems' country clusters

Academic career systems' country clusters	Where are positions mainly advertised?									
	Institutional	Institutional	National	National	International	International	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N	%	N
1	60	3	40	2	0	0	0	0	100	5
2	33	3	44	4	22	2	0	0	100	9
3	31	4	46	6	23	3	0	0	100	13
4	30	6	60	12	5	1	5	1	100	20
Total	34	16	51	24	13	6	2	1	100	47

Table 7.2.19: Main source of funding in R3 positions by academic career systems' country clusters

Academic career systems' country clusters	Main source of funding in R3 positions								Total	Total
	block funding	block funding	competitive funding	competitive funding	block or competitive funding	block or competitive funding	Total	Total		
	%	N	%	N	%	N	%	N		
1	80	4	0	0	20	1	100	5		
2	78	7	0	0	22	2	100	9		
3	62	8	15	2	23	3	100	13		
4	80	16	0	0	20	4	100	20		
Total	74	35	4	2	21	10	100	47		

Table 7.2.20: Level of HEI autonomy by academic career systems' country clusters

Academic systems' clusters	career country	Level of HEI autonomy						Total	
		low level		middle level		high level		Total	Total
		%	N	%	N	%	N		
1		0	0	20	1	80	4	100	5
2		0	0	44	4	56	5	100	9
3		23	3	54	7	23	3	100	13
4		30	6	55	11	15	3	100	20
Total		19	9	49	23	32	15	100	47

Table 7.2.21: Country-wide or institutional selection procedures by academic career systems' country clusters

Academic career systems' country clusters	Country-wide or institutional selection procedures institution-based		Country-wide or institutional selection procedures country-wide		Missing		Total	Total
	%	N	%	N	%	N	%	N
1	100	5	0	0	0	0	100	5
2	100	9	0	0	0	0	100	9
3	77	10	15	2	8	1	100	13
4	100	20	0	0	0	0	100	20
Total	94	44	4	2	2	1	100	47

7.2.4 Inter-organizational practices

Table 7.2.22: Degree of sectoral differentiation by academic career systems' country clusters

Academic career systems' country clusters	Degree of sectoral differentiation													
	R&D performed by business sector	R&D performed by business sector	R&D performed by business and HE sectors	R&D performed by business and HE sectors	R&D performed by business and government sectors	R&D performed by business and government sectors	R&D dominated by business sector but other sector are also relevant	R&D dominated by business sector but other sector are also relevant	R&D performed by all sectors on a relevant scale	R&D performed by all sectors on a relevant scale	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	40	2	40	2	20	1	0	0	0	0	0	0	100	5
2	0	0	78	7	0	0	0	0	0	0	22	2	100	9
3	0	0	38	5	0	0	15	2	23	3	23	3	100	13
4	30	6	25	5	5	1	5	1	20	4	15	3	100	20
Total	17	8	40	19	4	2	6	3	15	7	17	8	100	47

Table 7.2.23: Intersectoral mobility as a prerequisite of a particular career path by academic career systems' country clusters

Academic career systems' country clusters	Intersectoral mobility as a prerequisite of a particular career path							
	yes		no		Missing		Total	Total
	%	N	%	N	%	N	%	N
1	0	0	100	5	0	0	100	5
2	0	0	100	9	0	0	100	9
3	0	0	100	13	0	0	100	13
4	35	7	60	12	5	1	100	20
Total	15	7	83	39	2	1	100	47

Table 7.2.24: Vertical differentiation of HE sector by academic career systems' country clusters

Academic career systems' country clusters	Vertical differentiation of HE sector							
	teaching-only type of HEI		no teaching-only type of HEI		Missing		Total	Total
	%	N	%	N	%	N	%	N
1	20	1	80	4	0	0	100	5
2	33	3	67	6	0	0	100	9
3	8	1	85	11	8	1	100	13
4	25	5	60	12	15	3	100	20
Total	21	10	70	33	9	4	100	47

Table 7.2.25: Attractiveness of higher education compared to other sectors by academic career systems' country clusters

Academic career systems' country clusters	Attractiveness of higher education compared to other sectors												Total	Total
	less attractive		similarly attractive		attractive		more attractive		Missing		Total	Total		
	%	N	%	N	%	N	%	N	%	N				
1	0	0	40	2	40	2	20	1	100	5				
2	0	0	44	4	56	5	0	0	100	9				
3	15	2	69	9	15	2	0	0	100	13				
4	25	5	25	5	45	9	5	1	100	20				
Total	15	7	43	20	38	18	4	2	100	47				

Table 7.2.26: Competition by universities by academic career systems' country clusters

Academic career systems' country clusters	Competition by universities								Total	Total
	low level of competition		middle level of competition		high level of competition		Total	Total		
	%	N	%	N	%	N				
1	0	0	80	4	20	1	100	5		
2	0	0	100	9	0	0	100	9		
3	46	6	54	7	0	0	100	13		
4	75	15	25	5	0	0	100	20		
Total	45	21	53	25	2	1	100	47		

7.2.5 Academic disciplines

Table 7.2.27: Discipline-specific conditions during career by academic career systems' country clusters

Academic career systems' country clusters	Discipline-specific conditions during career									
	discipline equal conditions	con-	discipline conditions	equal	discipline-specific conditions	discipline-specific conditions	Missing	Missing	Total	Total
	%	N	%	N	%	N	%	N	%	N
1	20	1	40	2	40	2	40	2	100	5
2	0	0	100	9	0	0	0	0	100	9
3	46	6	54	7	0	0	0	0	100	13
4	75	15	20	4	5	1	5	1	100	20
Total	47	22	47	22	6	3	6	3	100	47