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**The differences in job quality among higher education graduates in Europe
a cross-national analysis of 17 countries**

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The differences in job quality among higher education graduates in Europe: A cross-national analysis of 17 countries

Predrag Lažetić

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

Department of Education

February 2017

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Abstract

This thesis investigates the diversity in job quality of university graduates in 17 European countries using multilevel regression modelling, based on combined REFLEX and HEGESCO graduate survey data. The focus of the research is on aspects of graduate jobs that affect quality, especially the analytically neglected aspects of skill utilisation and work autonomy, as well as income, job security and work life balance

First, for the purposes of measuring job quality, the thesis proposes an international multidimensional Graduate Job Quality Index (GJQI) with potential applications for further research and policy evaluation.

Second, the thesis analyses variance in graduate job quality across 258 sectors of economic activity in the 17 countries studied, and identifies a number of factors that are correlated with overall job quality and its dimensions.

The main research focus, however, is on contextual factors in the wider society and economy that help explain both diversity in job quality and differences between different sectors of the economy and different occupational groups. In particular: 1) the adoption of new computer technologies; 2) exposure to globalisation, and 3) high educational attainment in the labour force.

The study tests two broadly contrasting theoretical approaches to differences in graduate job quality: skill-biased technological change theory (Acemoglu, 2002) and the new institutionalism (Baker, 2014) on the one hand, and the conflict theory of global knowledge capitalism (Brown et al., 2012) on the other, and in empirical terms finds more support for the latter of two theoretical accounts.

List of abbreviations

EU – European Union

EWCS – European Working Conditions Survey

GJQI – Graduate Job Quality Index

HEGESCO - Higher Education as a Generator of Strategic Competences (project name)

ICT - Information and Communication Technology

ISCO 08 - International Standard Classification of Occupations 2008

ISCED – International Standard Classification of Education

ISSP – International Social Survey Programme

LFS – Labour Force Survey

NACE - Statistical classification of economic activities in the European Community

OECD – Organisation for Economic Co-operation and Development

REFLEX – project name

TNC - Transnational Corporations

1 Introduction: More graduates, more highly educated workers, better jobs?

This thesis is placed in the longstanding tradition of research on the relationship between higher education and the world of work. More precisely, it investigates the effects of higher education expansion (together with other parallel processes like increased use of technology, globalisation and labour market regulation on: 1) job quality of higher education graduates and 2) occupational differences in job quality within a growing highly educated labour force. The research was carried out in the European context and offers a comparative analysis of these processes in 17 European countries.

This chapter has three objectives. First, it outlines the research context, including the key policy debates around it. Second, it outlines the research problem and research questions. Third, the chapter offers an outline of the structure of the overall thesis.

1.1 The Research Context: the expansion of higher education and occupational changes in the labour force

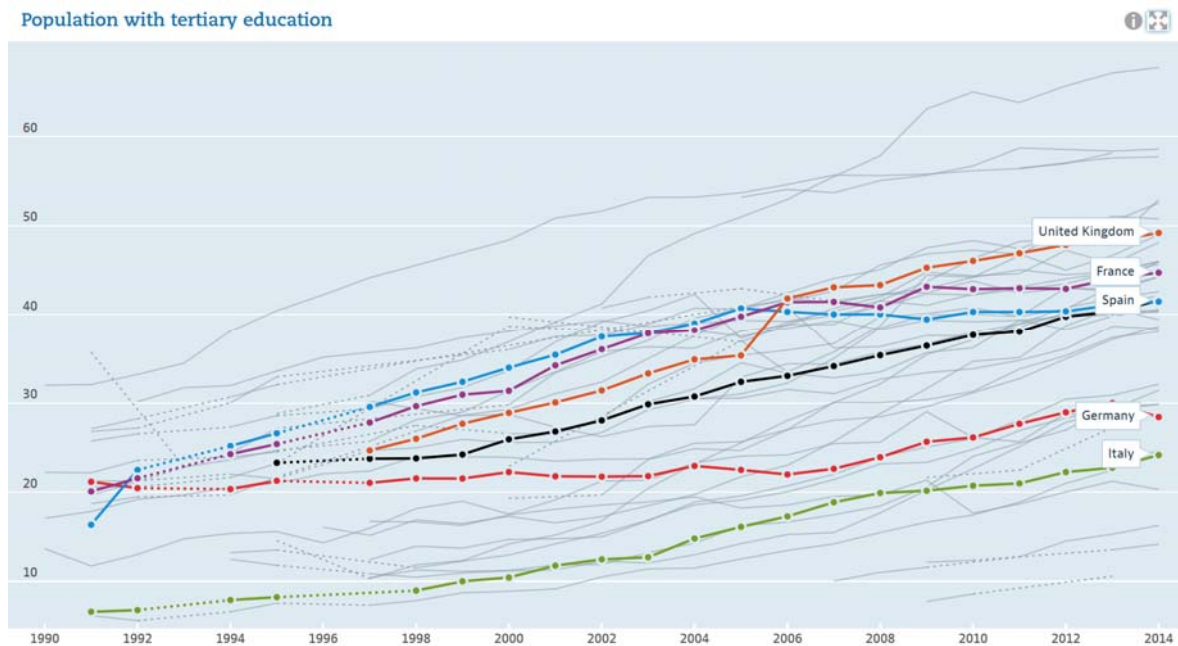
1.1.1 The growing graduate labour force

Global educational expansion, particularly since the Second World War, is a relatively well-documented phenomenon. The steady increase in educational attainment is a direct result of this trend in many countries. Recent comparative datasets based on official statistical sources and census surveys estimate that the average number of years of schooling for the world population has increased from 3.12 years in 1950 to 7.89 years in 2010 (Barro and Lee, 2013). Until recently, for a many developing countries the expansion of schooling has meant the expansion of the primary and secondary education sectors and an increase in basic literacy. In the group of 24 countries identified as advanced (OECD members), the most interesting trend is represented by the expansion of tertiary education. However, countries like China and India as well as those in Latin America are also now rapidly expanding their higher education

provision. Approximately 14.2 per cent of the world population over the age of 15 participated in or completed some kind of tertiary education in 2010 (compared with 2.2 percent in 1950). The figures for advanced economies are dramatically different and show that most of the global increase in tertiary educational attainment in the same period can be attributed to the expansion of higher education in these countries (Barro and Lee, 2013). Around one third of the population over the age of 15 in these countries (32.2 per cent in 2010) either completed or was participating in tertiary education in 2010, compared to 5.7 per cent in 1950.

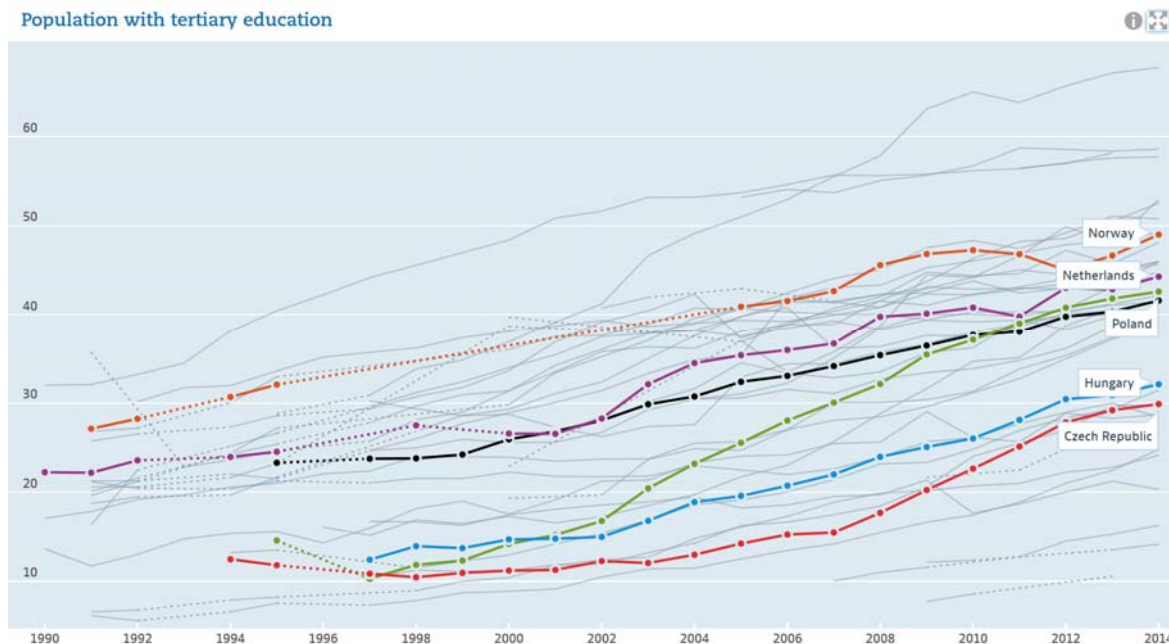
Following the general growth of tertiary education attainment levels, the higher education systems of some European countries have been champions of rapid increases in participation and consequently have had far higher tertiary education attainment rates in their populations, while in others the rate of growth has been much slower. Figure 1 below shows the trends in growth in tertiary education attainment in the last 25 years in major European countries, in comparison with the OECD average (marked in black). As we can see, the expansion of tertiary education was highest in the UK, which has had a constant steady growth rate above the OECD average, almost reaching 50% of the age cohort 25-34, followed by France and Spain, which are both above the OECD average, but which both have a trend towards stagnation in the last decade. On the other hand, Germany and Italy are well below the OECD average, with tertiary education attainment rates in the population aged 25-34 being below 30%, and in the case of Germany showing growth tendencies only in the last decade.

Figure 1: Population (25-34) with tertiary education. Growth in major European countries (UK; France; Spain; Germany; Italy) in comparison with OECD average (marked black) and other OECD members (1990-2014). Source: OECD



Smaller Benelux and Nordic countries (Figure 2, below) have some of the highest tertiary education attainment rates in the world (above the OECD average with attainment rates higher than 40%), being similar in that respect to the rate illustrated for the UK in Figure 1 above. On the other hand, some Eastern European countries, like Poland, Hungary and the Czech Republic, which have lagged behind the OECD average in the expansion of tertiary education, have in the last decade high rates of expansion (especially Poland) resulting in a sharp increase in tertiary education attainment within the young population (25-35 year olds) (Figure 2). One can find similar trends to those in Poland in the smaller Baltic states (Estonia and Lithuania) as well as in Slovenia (not depicted in the figures, in order to avoid overcrowding of charts).

Figure 2: Population (25-34) with tertiary education. Growth in Norway, Netherlands, Poland, Hungary and Czech Republic in comparison with OECD average (marked black) and other OECD members (1990-2014).
Source: OECD.



As expected, the expansion of enrolment in higher education results in higher attainment levels and leads to increases in the educational attainment of the labour force. The following figures (Figure 3 and Figure 4) show the growth of the highly educated labour force (people between 25 and 34 years old, in employment, who have completed tertiary education) between 2002 and 2014 in some of the 17 European countries compared in this research, together with EU-28 trend data¹. In some of the European countries compared in this thesis, namely Lithuania, Estonia and Poland (Figure 4), the proportion of the highly educated labour force aged 25-34 is not only above EU average, but in 2014 reached European record levels, so that every second worker in that age group now has a higher education degree, and in the case of Lithuania almost 60% are highly educated.

¹ Data presented come from the EUROSTAT EU Labour Force Survey data. The special custom made extractions with data aggregated at the much lower level were requested by the author and kindly provided by the Eurostat. General information about EU LFS data and their reliability for the comparison over time can be found at: http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_data_and_publication#Publication_guidelines_and_thresholds

Figure 3: Growth in the proportion of 25-34 year old population in employment with completed tertiary education in the UK, France, Spain, Germany and Italy compared with the EU-28 average. Source: EU LFS, Eurostat custom made data extractions.

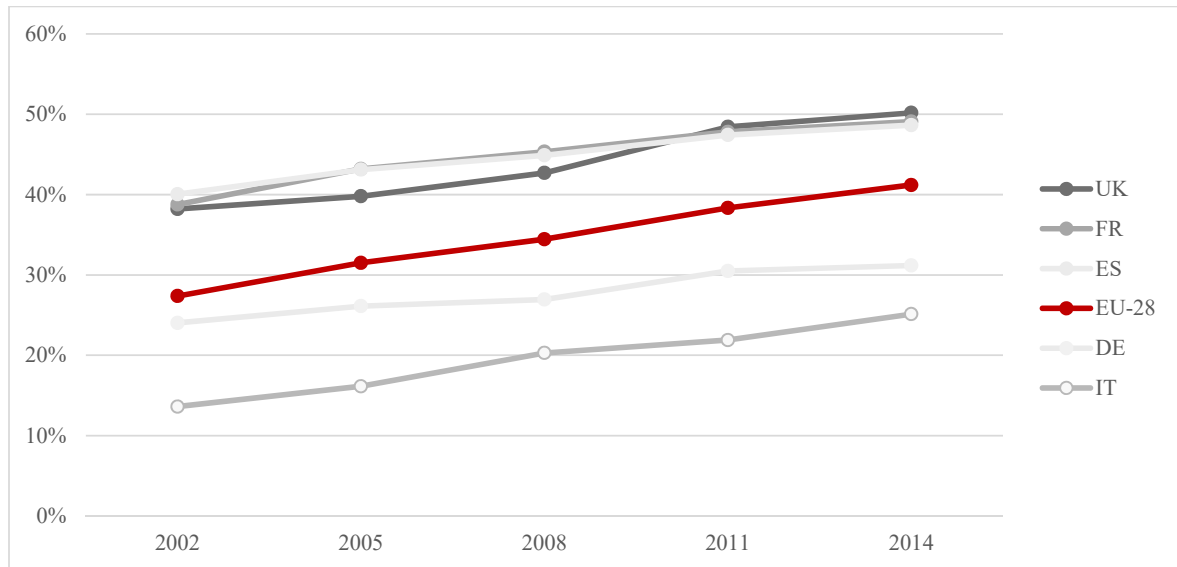
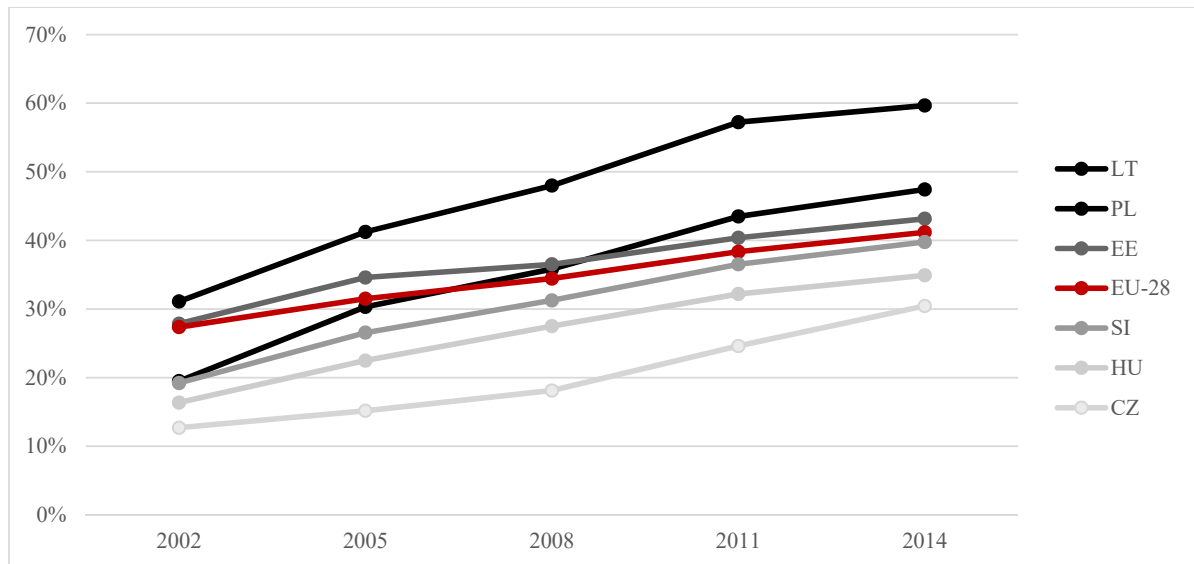


Figure 4: Growth in the proportion of 25-34 year old population in employment with completed tertiary education in six Eastern European countries compared with the EU-28 average. Source: EU LFS, Eurostat custom made data extractions.



The patterns of growth for the same age group in all countries largely follow the growth in education attainment in these countries. This supports the widely known fact that the unemployment rates of highly educated persons are generally low, and in general much lower than for persons of the same cohort without higher education degree.

Researchers with life long experience in this topic (Teichler, 2009) have noticed and documented policy discourse on the topic of over-education and mismatch from the very initiation of the trend of higher education expansion in the 1960s, despite the general feeling of economic optimism. The problem of graduate unemployment or more importantly underemployment was even more pronounced in the 1970s when the panicky term “academic proletariat” was coined (Teichler, 2002). Even the term “vertical substitution”, introduced to describe the gradual opening to graduates of positions that are almost as demanding as typical graduate positions but which were previously filled by persons with a slightly lower level of educational attainment, has been replaced with the more negative sounding term “displacement” in public debates (Teichler, 2009). Baker (2014, p.125) notes the difference between wealthy nations, in which the embittered PhD driving a taxi for a living became a seemingly downbeat symbol, while in less wealthy nations it was the angry young man with an upper secondary diploma who could not find a prestigious job in the civil service. In the 1980s, the general atmosphere of crisis about the employment implications of higher education expansion became more moderate, due basically to the general trend of adjustments in the labour market within occupational structures and work hierarchies (Teichler and Kehm, 1995). Interestingly, the debates about graduate over-education and potential unemployment became less prominent in the 1990s and 2000s, which some authors link with the developing discourse about the knowledge society and economy (Teichler, 2009), in which the increase in the number of highly educated people in society is seen as crucial for the professional tasks of a future envisaged as a globalised competitive regime of knowledge capitalism. The policy debate shifted from the systemic problem of over-education to the problem of employability, or more precisely the lack of it. The focus of the old problem of a mismatch between competences and job requirements was in this way shifted away from the macro level of the labour market to the micro level of the individual graduate who was indirectly blamed for a lack of employability,

Introduction: More graduates, more highly educated workers, better jobs?

and given the task of continuous lifelong learning and employability enhancement (Tomlinson, 2012). Finally, the latest debates around the problem of youth unemployment in Europe also revive the discourse of educational mismatch.

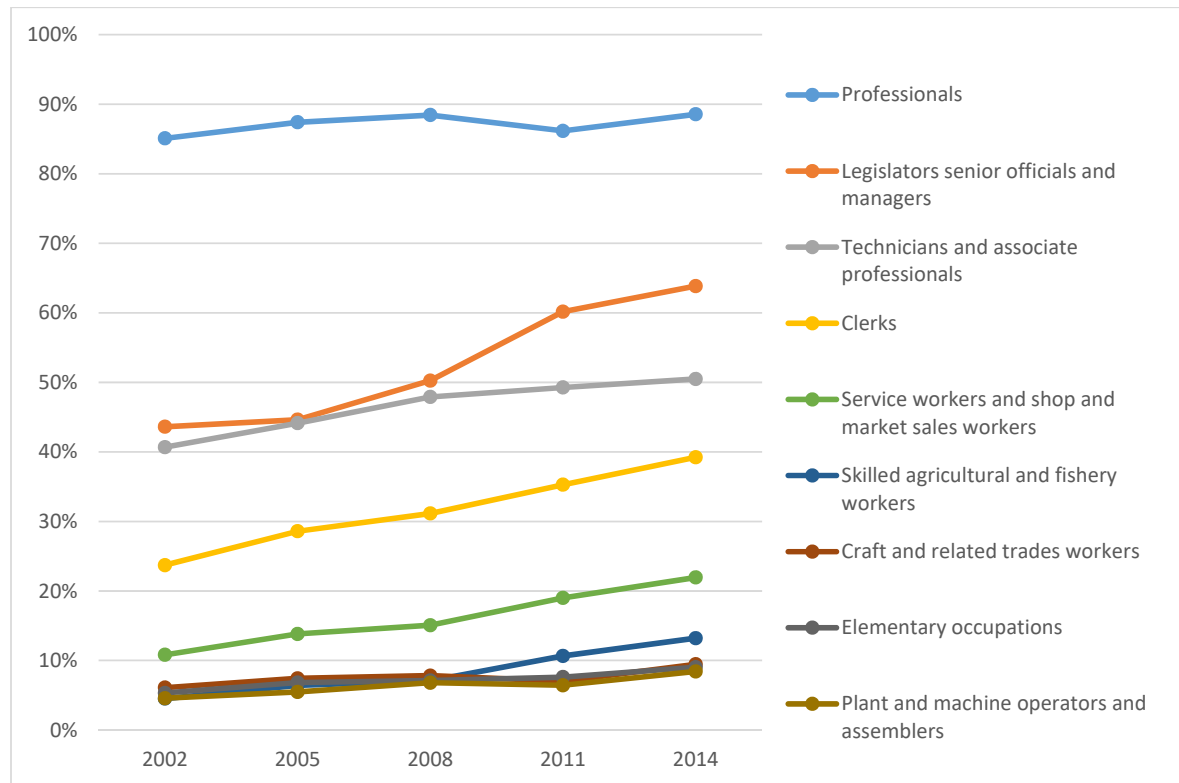
1.1.2 Higher education graduates in occupational hierarchies

As one can see from this short history of policy debates, since the beginning of the acceleration of higher education expansion, the problems associated with it have been constructed as ones of over qualification and underemployment or in other words as the problem of mismatch between supply and demand. As higher attainment in the labour force has increased, more graduates have found themselves working in occupations that in previous generations would have been filled by non-graduates. Figure 5 below illustrates how the graduate share of the major occupational groups within the EU-28 labour force aged between 25-34 changed between 2002 and 2014. Professional occupations have historically employed a majority of graduates. In this particular age group the graduate share of total employment in the EU is almost 90% but that share has not increased a lot over the period. In managerial positions, the graduate share increased most steeply (a 20 percentage point increase) and by 2014 almost two thirds of managers aged between 25 and 34 had a higher education degree. The second highest increase in graduate share was amongst clerical workers (an increase of 15.5 percentage points, with a 40% graduate share in 2014). Similarly, the graduate share in the category of service workers and shop and market sale workers almost doubled in the 12 year period analysed. Within associate professional and technical occupations in 2014 there were nearly as many graduates as non-graduates, while the graduate share had increased 10 percentage points over the given period. The remaining occupations had a relatively insignificant share of graduates at the turn of the millennium, a share that has increased not so dramatically to around 10% for manual occupations and even for elementary occupations by 2014. The sharpest graduate share rise at the lower skills end of the occupational spectrum was

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in the category of skilled agricultural and fishery workers (8.6 percentage points). As we can see, the supply of graduates could not be fully absorbed into groups of professional workers, leading to their filtering down into other occupational categories.

Figure 5: Graduate share in the major occupation groups as the part of the labour force aged 24-35 in EU-28.
Source: EU LFS, Eurostat custom made data extractions.



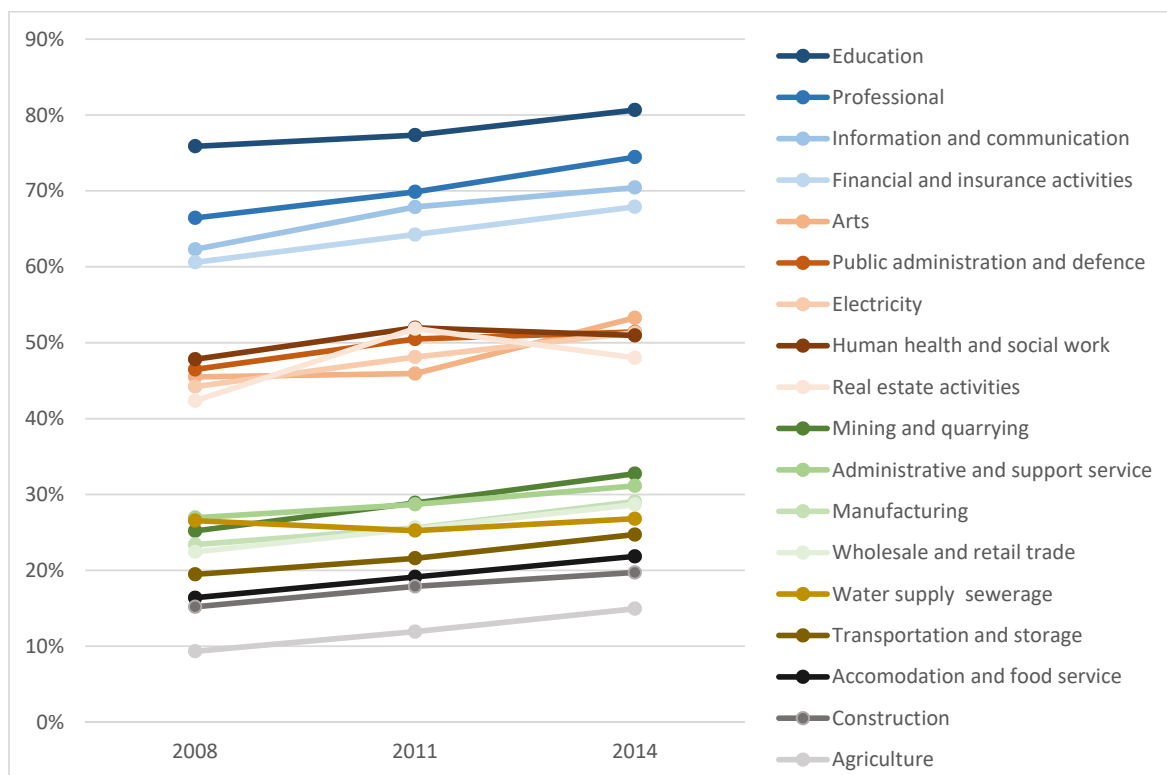
Furthermore, regardless of the increased supply of graduates it seems that the gap between sectors of economic activity in terms of the graduate share of employment remains relatively stable. Analysis of the graduate share of employment in the major sectors of economic activity (again in the 25-34 age group) shows increases at almost the same rate in all economic sectors in the EU-28 in the period between 2008² and 2014 (Figure 6). However, the same figure shows that there is a strong hierarchical grouping of sectors in terms of graduate share of employment.

² The analysed period is different from that analysed in the case of growth trends in the graduate share within major occupational groups. The reason is the limited comparability of the data series before and after 2005 when the major reform of the Statistical classification of economic activities in the European Community (NACE) was conducted.

Introduction: More graduates, more highly educated workers, better jobs?

At the very top with between 60-80% of graduate share are education, the professional services sector (legal, accounting, bookkeeping, auditing, architectural, engineering and other technical professional services), the information and communication sector and the financial sector. The middle category of sectors in terms of graduate share (40-60%): the arts, culture and media, public administration and defence, energy and electricity supply, real estate and the health and social work sectors. Lastly the bottom group, with 10-30% of graduate share, contains all remaining sectors, within which mining and administrative and support activities, manufacturing and wholesale and trade have highest graduate share of employment in the analysed age group.

Figure 6: Graduate share in sectors of economic activity of the part of the labour force aged 24-35 in EU-28.
 Source: EU LFS, Eurostat custom made data extractions.

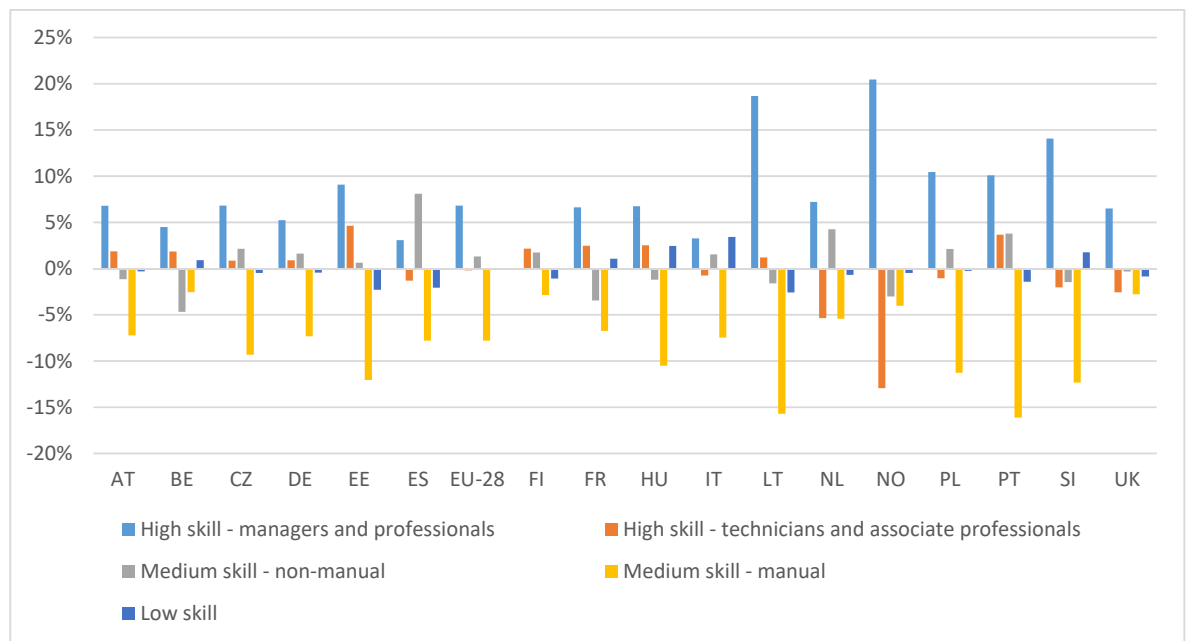


As we can see from Figure 5, the expansion of higher education does change the overall education level within different occupational categories in the labour force of the EU, although the major differences in educational attainment between sectors of economic activity remain

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relatively stable over time. However, one important process has occurred in parallel. Namely, it is not only the educational level of occupational categories and sectors that changes with the expansion of education, the occupational structures themselves also change significantly, often independently from the process of educational expansion. Occupational changes are only partly due to education expansion, as there are many other external forces like technological change, globalisation, migration etc. (Oesch, 2013) that contribute to the rise of some occupation groups and decreases in others. The next figure (Figure 7) illustrates the patterns of overall occupational change in the EU-28 and the 17 European countries covered in this analysis, within the 25-34 age group of the labour force. In the figure, occupations are grouped according to the International Standard Classification of Occupations 2008 (ISCO 08) grouping of occupational groups according to skill levels.³

Figure 7: Change in employment proportion in different occupational groups within the part of the labour force aged 25-34 in 17 European countries and EU-28 between 2002 and 2014. Source: EU LFS, Eurostat custom made data extractions



³ The high skill group consists of two subgroups: a) professionals and managers and b) technicians and associate professionals. The medium skill group can be also divided into two subgroups: a) skilled non-manual workers which includes clerks, service and sales workers and b) skilled manual workers which includes craftsmen, skilled agricultural workers, and machine and plant operators. The low skill category includes elementary occupations.

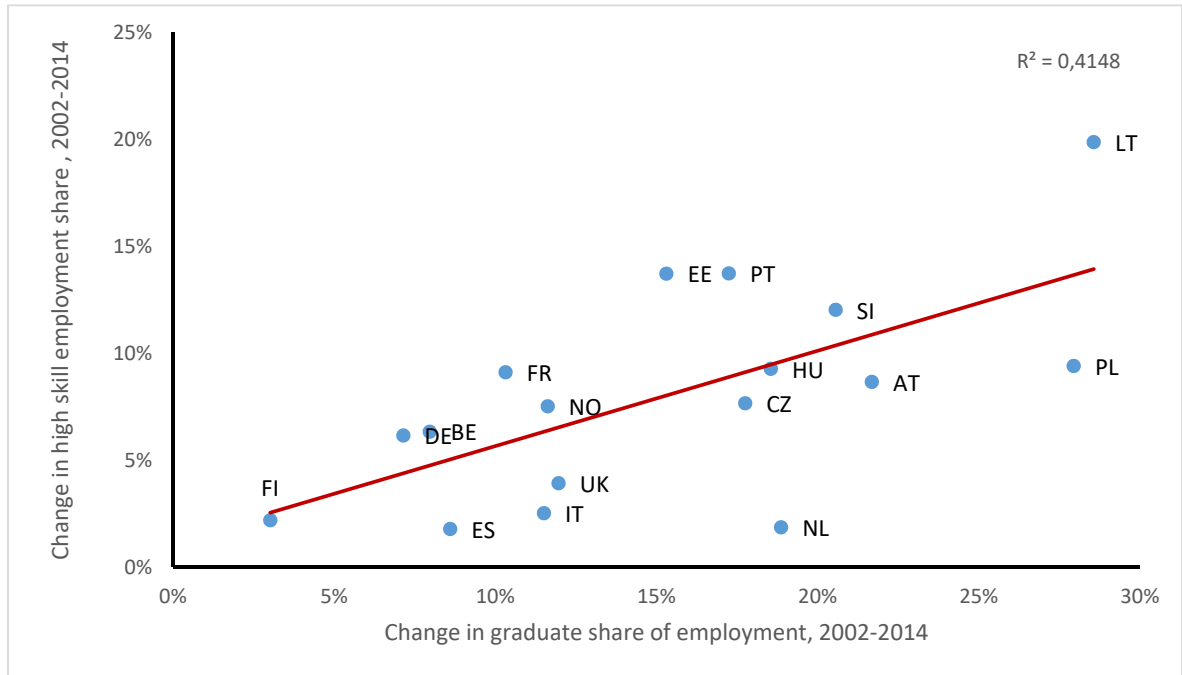
Figure 7 shows that the emergence of an hourglass labour market is not as straightforward as claimed by some previous research (Goos and Manning, 2007). The only overall pattern visible in all countries is the increase in share of workers working in the high skill occupations of managers and professionals and the decrease in the number of workers in the manual medium skill category. The share of high skilled workers - technicians and associate professionals, increased in the majority of countries with the exception of Spain, Italy, the Netherlands, Slovenia and the UK. The striking increase in the share of medium skilled non-manual workers which includes clerks and service and sales workers is however evident in some countries, namely in the Czech Republic, Spain, Italy, Poland and the Netherlands. The share of employment in medium skills non-manual occupations as well in low skill elementary occupations increases in some countries and decreases in others, so that no general conclusion about these types of occupations can be made.

The question that remains is, however, where do higher education graduates fit in the overall pattern of occupational change in the labour force? Do they contribute equally in all countries to the increase in the number of professionals (professionalization), in the process some authors referred to as the emergence of the knowledge society (Bell, 1976), or do they in some countries contribute to the increases in the non-manual medium skill labour force (clerks and shop and sales workers) a process often referred to by concerned policy makers and researchers 'over-education', 'underemployment', 'over-qualification' or 'underutilisation'.

Differences in countries' capacity to employ increasing numbers of higher education graduates in high skill occupations remain substantial. In many countries graduate numbers increase faster than economies are able to create jobs in categories like managers, professionals and associate professionals (which were traditionally designated for workers with higher education degrees). In other countries this seems to be no problem. The following figures illustrate this country variance.

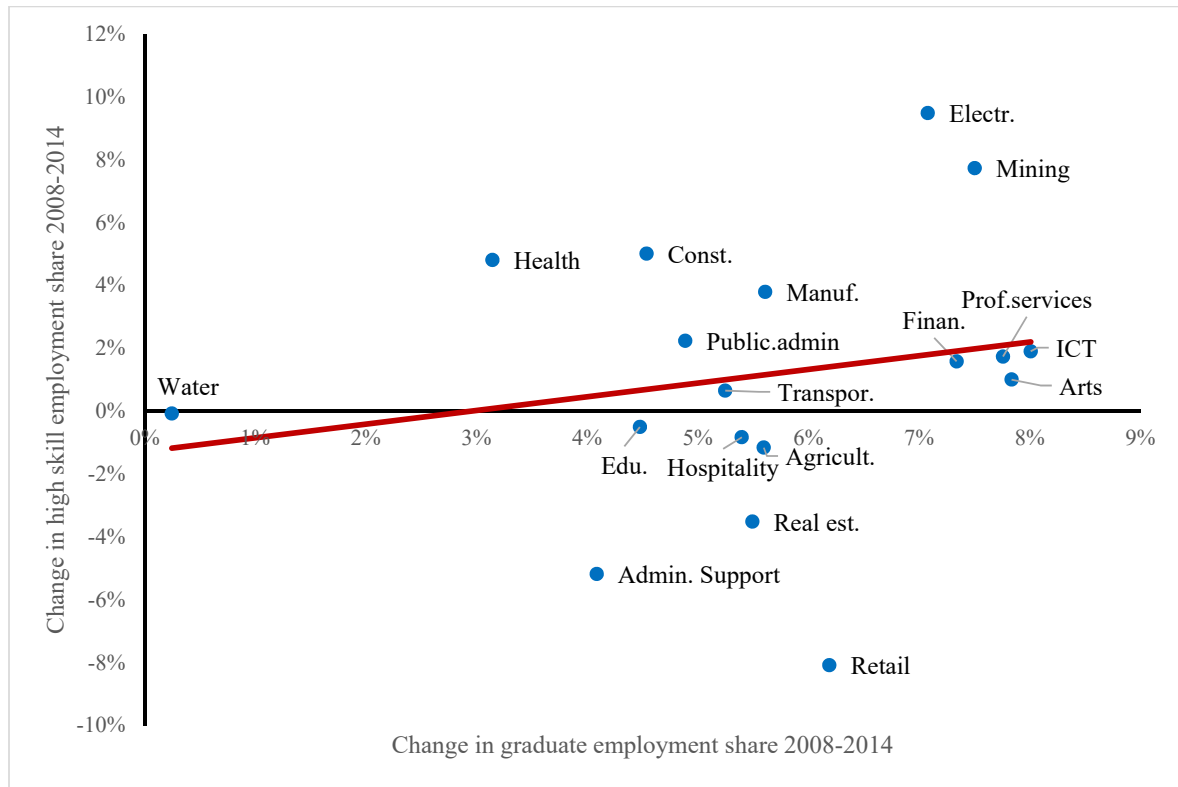
Firstly, country differences can be best illustrated by comparing the change in the proportion of the workforce who are graduates with the growth of high-skill jobs (a similar approach to that of Holmes and Mayhew, 2015). Figure 8 shows that there is a weak yet positive relationship between the two, although in all countries, speaking in simplistic terms, supply outpaces demand, expressed in terms of the growth of managerial and professional jobs (just as concluded by Holmes and Mayhew, 2015). In some major European countries (Spain, the UK, Italy, Poland and the Netherlands) which lie below the regression line, the rate of graduate supply exceeds the rate of demand for high skill jobs much more than in countries above the regression line (Figure 8). Interestingly, these are the same countries in which the share of non-manual medium skill workers has increased, as previously noted (indicating that the graduate surplus is mostly filtered down to these categories). One can assume that these countries were particularly bad at generating new high skilled jobs for their large stock of graduates. Poland, for instance, has witnessed one of the highest rates of higher education expansion across Europe over recent decades, but has not seen an increase in high-skill jobs matching that expansion – indeed, a number of countries with a slower expansion in the higher education sector (e.g. Germany) have experienced a larger increase in high-skill jobs.

Figure 8: Changes in high skill supply (change in graduate share of employment) and demand (change in employment share of high skill occupations), of the part of the labour force 25-34 years old, 2002-2014. Source: EU LFS, Eurostat custom made data extractions



Similarly, when comparing sectors of economic activity in the same age group of the labour force in the EU- 28 (Figure 9) one can observe that in the vast majority of sectors of economic activity the growth of the graduate labour force outpaces growth in the number of high skilled jobs. A striking finding is that in some sectors there is an evident process of de-professionalisation (a decrease in the proportion of managerial, professional and semi-professional jobs) and regardless of that these sectors employ higher shares of higher education graduates. These sectors are all placed below the regression line in Figure 9, but also have negative values on the y axis: Agriculture, the Hospitality industry (accommodation and food services), Education, Real Estate activities, Administrative and Support activities and Wholesale and Retail.

Figure 9: Changes in high skill supply (change in graduate share of employment) and demand (change in employment share of high skill occupations) in different sectors of economic activity in EU-28, in the part of the labour force 25-34 years old, 2008-2014. Source: EU LFS, Eurostat custom made data extractions



1.2 Research problem and questions

The previous figures illustrate that the expansion of higher education and the increased number of higher education graduates leads to the well-documented phenomenon described as *occupational filtering* (Holmes and Mayhew, 2015) or *vertical substitution* (Teichler and Kehm, 1995) within the occupational hierarchy. Namely, not being able to find jobs in higher occupational categories, many recent graduates find themselves further down the occupational hierarchy. At the same time, the figures indicate that there is a *professionalization* phenomenon in at least some segments of the labour force, as the general share of occupations considered high skilled (professionals and managers) is growing in all the European countries analysed, and in many but not all sectors of the economy. These trends naturally led policy makers and researchers to ask 1) ask whether more graduate jobs also imply better graduate jobs? and (2), try to identify which contextual factors at the level of, for instance, sector or country of

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employment, explain the unequal distribution (variance) of job quality? These two general problems are also the main research problems this thesis seeks to address.

The occupational filtering phenomenon represents a problem only if one assumes that there is the so called “Treiman constant” named after renowned sociologist Donald Treiman (Treiman, 2013), who was the first to conclude that occupational hierarchies in terms of prestige, levels of education and income are stable across countries and across time, so that they allow, for instance, studies of inter-generational social mobility (for a review of social stratification research see Hout and DiPrete, 2006). So if occupation equals job quality, and if occupational hierarchies indicate the distribution of job quality, then we can assume from the previously presented data that the expansion of higher education mediated through the process of occupational filtering down, inevitably leads to ever worse jobs for higher education graduates. Similarly we can assume that the increases in the number of graduate jobs in the professional and management categories imply an increase in the quality of jobs, so in these simplistic terms the analysis of the distribution of graduate job quality could end here.

However, there are strong indications that even if the prestige and income gap within occupational hierarchies remain constant, the skill requirements of jobs, and the degree of work autonomy in particular jobs or wage levels do indeed change over time under the influence of factors like technology changes, globalisation and the labour market policies. For instance in terms of changes of skill content, Holmes and Mayhew (2015) indicated that the process of occupational filtering down is not necessarily always a problem (for example) of overqualification. Other processes can be at stake and as Holmes and Mayhew (2015) show, these processes change the content of some occupations in terms of 1) “worker upskilling”, meaning that the supply of skills increases to meet the higher constant demand of some jobs for which previously employers could not find sufficiently qualified workers or 2) “job upgrading”, that there has been an increase in demand for skills within these occupational

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groups at the same time as the supply of graduates has increased. On the other hand, there is wide scepticism about the high quality of jobs in the growing professional occupational groups, which in the context of digital Taylorism may also become more routinized and prone to ever further segmentation and differentiation of tasks (Brown, Lauder, and Ashton, 2012). Based on these arguments, one can conclude that in order to better understand graduate job quality, one must look beyond the occupational categories in which graduates find employment.

Alternative attempts have been undertaken to estimate graduate job quality in a different way, to see if more graduate jobs imply good graduate jobs. However, most of them focus on only one aspect of job quality (for example, skill) by estimating the levels of graduate job quality within the discourse of mismatch and overeducation. Estimation of the skill requirement aspects of graduate jobs has been undertaken by creating a classification of graduate jobs (Elias and Purcell, 2013), or by estimating the required educational level of a job as the mean qualification level possessed by workers in each occupational group (Cedefop, 2012, Cedefop is an EU agency dealing with vocational education and training). These methods usually focus on issues of skill level and education level requirements for specific types of jobs and have multiple methodological deficits (Holmes and Mayhew, 2015). The tradition of research on occupational changes in the economy, on the other hand, usually deploy mean wage levels combined with occupational categories (Oesch, 2013; Wright and Dwyer, 2003). One reason why this combination of occupations and wage medians is used, as a crude and imprecise measure of job quality (e.g. Goos and Manning, 2007; Oesch, 2013; Wright and Dwyer, 2003), is the limited availability of other variables within repeated cross-sectional data, for example in the labour force surveys that are often used in economics and social research. For instance, there is a general absence of data that more precisely observes the types of skills demanded in the workplace or issues of work autonomy (discretion).

The final alternative approach to the measurement of job quality in general in the labour force is to use social surveys in which participants report a wider range of issues related to work conditions. This approach is usually referred to as the subjective method because it relies on workers' self-reporting of features of their own work (Holmes and Mayhew, 2015). Examples of this approach are, for instance, the use of the International Social Survey data (e.g. Stier, 2015) or the European Working Conditions Survey (Holman, 2013). These surveys, because of their wide target group, do not represent a good basis for analysis of a very small segment of the population like recent higher education graduates and their jobs. The quality of graduate jobs has therefore usually been studied through the use of limited national survey datasets on workplace relations (an example from the UK is Holmes and Mayhew, 2015) and in single university graduate tracer surveys (Bocuzzo and Gianecchini, 2014).

The arguments above, about the inadequacy of relying solely on occupational categories, qualification level requirements or mean wages in assessing the main research problem, lead to the first research question of this thesis:

Question 1: What constitutes graduate job quality and what is the best way to measure it?

In providing answers to this question, this thesis attempts to overcome the problem of inadequate comparative data sources for more nuanced measurement of the quality of graduate jobs by using the comparative graduate survey data collected in 19 European countries and Japan in 2005 and 2008 by the REFLEX and HEGESCO research projects.⁴ In this respect the analysis relies on the way higher education graduates in Europe assess their own jobs five years after graduation in various aspects beyond occupation, income and mismatch in qualification requirements.

⁴ The data set is described in detail in the chapter on measurement of job quality. The anonymised scientific use datasets are archived within Dutch data archive: <https://dans.knaw.nl/en> and were made available to the author upon application.

Using data from a graduate survey that contained for example a whole battery of questions on different skill demands in jobs, over simply relying on occupational groups and wage medians as proxies for overall job quality has multiple analytical advantages. For instance, occupational definitions alone cannot tell us if graduates, even when working as managers and professionals, use the skills obtained in education, and what skills bring most premiums in terms of job quality. The REFLEX and HEGESCO graduate surveys data also provide graduates' answers on the extent of their autonomy in work or how secure and well paid their graduate jobs are. In that respect these data represent a basis for a comprehensive measurement of graduate job quality that is necessary in order to assess the fundamental research problem outlined at the beginning of this chapter. In order to assess whether more graduate jobs (e.g. in one sector of the economy) means better graduate jobs, one must first develop a sensible and multidimensional approach for the estimation of job quality. In that respect, this thesis develops a Graduate Job Quality Index (GJQI) as an instrument for the measurement of graduate job quality, which has the potential for further application in research or policy evaluation.

Once adequate measures of graduate job quality have been developed, the research comes back to the second key problem outlined in this chapter, the identification of contextual social factors beyond the higher education expansion in order to explain the unequal distribution of job quality amongst graduates employed in different occupations in and between different sectors of the economy.

The research focuses on two main factors, which both in theory and reality have been seen to have a huge impact on job quality. These are: 1) technological development and the increased use of new information and computer technologies, and 2) global international trade and processes like offshoring and outsourcing. The impact of these processes on so-called high skilled jobs (which almost always means graduate jobs) is highly contested and the research on job quality in this thesis is placed between broadly contrasting theoretical accounts.

On the one hand, skill-biased technological change theory (Acemoglu, 2002) and the new institutionalism (D. Baker, 2014) provide an optimistic account of the knowledge society and economy which would be of benefit to graduate “knowledge workers” because the new information technologies are skill biased, meaning that they replace only routinized low-skill labour while benefitting knowledge intensive jobs both in terms of quantity (more jobs) and quality (more rewarding jobs in terms of skill utilisation, more work autonomy and higher wages). As a result of their highly skilled jobs, according to skill bias theory, graduate workers may be protected from the potential negative impacts of globalisation, as their jobs are not likely to be offshored or outsourced (Goldin and Katz, 2007, p.138). Both new institutionalism and skill bias technological change theory envisage that an increase in the educational attainment of the labour force will gradually decrease the gap in job quality between graduates employed in different occupational strata.

On the other hand, this positive outlook is contested by the conflict theory of global knowledge capitalism (Brown et al., 2012) which envisages that new technologies, in combination with the globalised economy, will have a deteriorating effect on the job quality of higher education graduates especially in terms of skill utilisation and work autonomy. Professional and managerial knowledge work is seen to be increasingly segmented and routinised in a process of digital Taylorism so that it can be easily be offshored and outsourced. The end result may be the global vertical stratification of graduate jobs in terms of their quality.

Following the research aim outlined above and in the light of the contested theories in which this research is anchored, the second major research question can be formulated as:

Question 2: To what extent do differences in 1) adoption of new computer technologies, 2) exposure to globalisation, and 3) high educational attainment in the labour force explain the differences in graduate job quality between graduates working in different sectors of the economy and in different occupational groups?

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Addressing this broad research question is achieved by providing answers to 3 concrete sub questions:

Sub-question 2.1: What are the individual and contextual (sector and country level factors) which are associated with graduate job quality and its dimensions?

Sub-question 2.2: How do underemployed graduate workers fare compared to other workers on a variety of job quality dimensions?

Sub-question 2.3: What are the conditions, at the economic sector level, under which the gap in job quality between graduates employed in different occupational categories widens?

In addressing the second question and its three sub-questions, the thesis uses multilevel regression modelling which allows differentiation between effects at both the individual and the macro level (in this case economic sector level).

1.3 Overview of the thesis

After this introduction, which has explained the context from which the research questions derived, Chapter 2 will focus on: a) the theoretical background which was used to operationalise the concept of graduate job quality and b) the different theoretical approaches to educational and technological change (consensus and conflict theories) used to understand and justify higher education expansion and its effects on the occupational structures and jobs within these structures. One of the main proposals of this thesis is to find alternatives to occupational groups or wage as the sole measures of bad and good jobs and propose a more nuanced and multidimensional concept of job quality.

Chapter 3 is focused on providing answers to the first research question. It identifies the dimensions for the estimation of graduate job quality within the available data sets and proposes a composite Graduate Job Quality Index (GJQI) which is then tested for its validity in terms of the estimation of graduates' wishes and plans to leave their current job. The

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potential use of this index is foreseen not only for research but also for policy purposes, in order to assess whether more jobs in an economy necessarily imply better jobs.

Chapter 4 is the main analytical chapter, which addresses the second research question and its 3 sub questions. It presents the results of multilevel regression modelling of the previously developed GJQI and its five dimensions (skill utilisation, work autonomy, income, job security and work life balance). The principle aim of this analysis is to assess the validity of two contesting contemporary theoretical accounts which can be broadly represented by the consensus theories of educational and technological change and by conflict theories best represented by global knowledge capitalism theory, on how 1) use of new computer technologies, 2) globalisation exposure and 3) higher educational attainment in the labour as the major macro level contextual factors are positively or negatively associated with a) graduate job quality and its dimensions; b) the widening or narrowing of the gap in job quality between graduates employed in different occupational groups.

Chapter 5 summarises the findings in light of the research questions, discusses the theoretical and political implications of these findings, outlines the limitations of the research approach taken and proposes areas and direction for further research.

2 Educational expansion, the world of work and job quality - theoretical frameworks

This chapter examines the key education-economy theories by which we seek to explain the data patterns in the following analysis with respect to the distribution and quality of graduate jobs. These theories can be classified in two: consensus and conflict theories (Lauder, Brown, Dillabough, Halsey, & others, 2006). The consensus theories assume that the combination of education and technology will produce rising employment and good quality jobs for graduates, while overall technology will produce a rise in living standards. As such, progress does not need to be seen in terms of conflict. The theories that comprise this group are: skill bias theory (see e.g., Acemoglu, 2002) and the neo-Institutionalism of Baker (2014).

While consensus theories have stressed the significance of education and technology, conflict theories stress the role of capitalism framing the role of both education and technology. In contrast to the idea that technology will lead to an increase in the demand and quality of graduate work, conflict theories stress the problematic nature of labour and particularly skilled labour under capitalism (Brown et al., 2012). Driving down costs within the global competition is seen as central to competitiveness. The development of global labour markets and business processes has enabled Transnational Corporations (TNCs) to engage in arbitrage over the costs of graduate labour. This means that given two graduates with equal qualifications, one in East Asia and the other in the UK, all other things being equal, TNCs will choose the cheaper graduate in East Asia. At the same time technology has enabled many jobs that were formerly seen as 'knowledge jobs' to be either routinized or replaced. With a broad brush it can be seen how these contrasting theories can create different explanations for the nature of graduate work. In this way the concept of job quality can be theoretically anchored and operationalised. The concept of job quality implies the rejection of the view that occupational groups or wages

should be seen as the sole measures of 'bad' and 'good' graduate jobs by introducing the more nuanced and multidimensional concept of job quality.

Here a caveat should be entered. These theories assume that there is a causal relationship between the factors of higher education, technology and globalisation, although the direction of causation is different in some of these theories. However, the question of whether the move to mass higher education has a direct causal impact on the labour market in the way the above theories assume. Here, the work of (Schofer and Meyer, 2005) will be discussed.

The principle aim of the thesis then is to test these theories within the scope and limits of available data on graduate jobs in Europe (Chapter 4) in order to assess which set of theoretical assumptions about factors which determine: 1) the distribution and variety of graduate jobs quality, and 2) occupational inequality in graduate job quality, have empirical support.

2.1 Education, Technology and Economic Progress

The progressive role of technology has been central in understanding how education can contribute to economic progress. This is especially so in the United States (Noble, 1979). In particular, technological development, based on increasing rationalisation and differentiation in the division of labour, creates a collective need for specialised training and education (Bell, 1976; Collins, 1971, 1979; Schofer and Meyer, 2005). In simple words, it appears that processes outside education (technological change) create increasing demand for more skilled and consequently a more productive labour force, so that the rise in demand motivates the expansion of higher education. According to this argument, education appears to be a secondary social institution, which follows changes in society and economy, for example advances in technology and increases in the economic importance of knowledge.

The idea that rationally developed technology would lead to a growing differentiation within the workforce and hence to increased demand for qualified labour, also known as *upskilling* (more engineers than machine operators), is not new and derives from the optimistic view of North American industrialism immediately after World War II (Oesch, 2013). From the late 1960s, the successor theory of post-industrial society (Bell, 1976) developed this argument further, envisaging that technical and scientific progress in combination with service sector expansion would stimulate the need for professionals and managers, while routine tasks would be taken over by technology.

Bell (1976) conceptualises post-modern society as a knowledge society⁵. This analytical concept implies that knowledge (seen mostly as technical skills acquired through education) will become a new rival source of economic power in post-modern society and that non-profit sectors like health, education and research will expand (Bell, 1976). According to Bell, theoretical knowledge is a “source of innovation and policy formulation for the society” (Bell, 1976, p. 14). Based on trends that were already visible in the USA in the 1970s, Bell pointed to several markers of post-industrial society: a majority of the workforce employed in the service sector processing information instead of in the goods production sector; the growth of government service sectors like education and health; the dominance of white collar workers (professionals and technical occupational categories); knowledge as a key economic resource, access to capital through education instead of inheritance and the centrality of theoretical knowledge (Bell, 1976, p.117). Bell (ibid. 128) sees education, and in particular higher education, as the key social mechanism by which the provision of technical and professional skills allows entry into the post-industrial society. Beside major quantitative trends, which

⁵ The image of post-industrial society or knowledge society converges theoretically with the new institutionalism thesis about the schooled society outlined later within this chapter. The main difference however is that the point of arrival of the knowledge society is not seen as caused by exogenous processes of technological change and bureaucratisation but by the transformative nature of education itself.

indicate the transformation into post-industrial society e.g. an increase in the professional and technical labour force, Bell identifies several qualitative changes in the nature of work in such a society.

The first of these, is about the nature of service work, which implies according to Bell (and given the time this was written) only communication between individuals instead of interaction with machines (Bell, 1976, p. 163). Communication between individuals requires inter-personal social skills and a higher level of communicative competence. The second change is a decrease in hierarchical work structures and the emergence of new structural forms of non-bureaucratic organisation (ibid, p. 153). The third, is the observation that service work is characteristically organised into smaller, autonomous working units instead of big corporations which is seen as contributory to a higher degree of professional control (ibid, p. 161). Furthering these observations, one can argue that higher education graduates who have exactly these skills (interpersonal skills, teamwork and coordination skills and more autonomous work abilities) would be awarded better jobs than non-graduates in the same work and hence profit more from the technological and organisational change that he documents. Bell's contribution stressed the significance of formal education in the development of the post-industrial society alongside technology.

To see how strong the connection between education and technology has been in thinking through the education-economy relationship, consider Randall Collins's book *The Credential Society* (1979). Beside his main argument about the increasing importance of educational credentials in the function of status competition, which places his work in the group of conflict theories, Collins also argues that education expansion is part of a larger "myth of technocracy" which assumes that society changes because of the changes in technology. Hence, education represents the social mechanisms that facilitate social change induced by technological advances (Collins, 1979).

However the most prominent and more recent theory in this tradition is the skill-bias theory of skill formation (e.g. Acemoglu, 2002).

2.1.1 Skill bias technology theory

Since the 1990s technological driven upskilling has become widely accepted in orthodox economics represented by the theory of skill biased technological development (Acemoglu, 2002). The theory predicts that the increase in the importance of new information technologies and technological development in general will result in increased demand for new specialised skills and professional knowledge, which is to be provided through formal education at universities or outside them, in-service training and lifelong learning (Acemoglu, 2002). This technological demand is thus seen as the main driving force for higher education expansion. In this respect, new information technology has been seen as biased towards raising the demand for skills rather than replacing them, as was the historical case with technologies in the industrial revolution (Goldin and Katz, 2008). Namely, in the early industrial revolution technological advances e.g. the mechanisation of the textile industry, crowded out skilled artisans and made increasing use of un-skilled labour. In the modern age, however, the proponents of the skill biased theory argue that since the second industrial revolution (the development of electricity and the chemical industry), and finally with the third industrial revolution that brought electronic technologies such as computers and telecommunications, technological innovations have stimulated demand for professional and managerial staff in preference to production workers (Goldin and Katz, 1998). In this way technology is seen as complementary to highly educated employees, but it is a substitute for lowly educated workers (Oesch, 2013). The proponents of the theory support this claim with two main pieces of evidence: firstly that on the aggregate, the number of graduate workers and wages (measured as group medians) has risen in the USA, especially since the start of the ICT revolution in the 1980s, in comparison with less qualified workers (Katz and Murphy, 1992); secondly, that

increased inequality in median wages between high skilled (understood as highly educated) workers and low skill workers is correlated with computer based technologies in companies (Fernandez, 2001), and hence wage premiums (taken here as a proxy measure for good jobs) are associated with computer use (Krueger, 1993).

The reason for this lies in the assumption that computers tend only to replace routine, repetitive tasks that can be programmed in advance, so the jobs which required skills like dexterity, repetitive tasks and operation monitoring are now redundant (Oesch, 2013). On the other hand, jobs that require more analytical skills, creative thinking and problem solving are in greater demand and hence scarcer and better paid in a computerised world. As these jobs are assumed to be acquired in higher education, the graduate employment share rises and this demand fuels higher education expansion.

A more nuanced version of the theory by Autor, Levy and Murane (2003) incorporates questions of work routinisation under the influence of computer technology. It sees that technology might replace human labour mainly in the routine tasks, regardless of whether they are cognitive or manual. Computerisation deskills and reduces demand equally in craft and production jobs, as it deskills more complicated (yet routinized) cognitive and communicative jobs such as those of cashiers, telephone operators, bookkeepers and clerks, which were usually in the middle of the occupational hierarchy, because they required a certain level of numeracy and literacy. On the other hand, computer technology is seen not to replace non-routine tasks regardless of how complex they are and what level of skills they require (Autor, Levy, and Murnane, 2003). Computer technology, for instance, has very little impact on interpersonal tasks and the demand for many low skilled jobs such as nursing assistants, waiters or childcare assistants (Oesch, 2013) which require social skills and are difficult to automate. Hence, the increased use and development of technology leads to rising relative demand for well paid professional and managerial jobs which typically require non-routine and advanced cognitive

skills and in low paid least-skilled jobs that typically require non-routine manual or interpersonal skills. On the other hand, it leads to falling relative demand for middle occupations that require typically routine manual or routine cognitive skills in the process termed job polarisation (Goos and Manning, 2007; Goos, Manning, and Salomons, 2009).

Proponents of the theory acknowledged that technology is not the only factor affecting what type of labour businesses would demand. Citing Manning's work, Oesch (2013, p. 17) notes that for example we have more nursing assistant jobs today because of an ageing population, fewer workers in the steel and coal industries because of declining government subsidies and fewer workers in textiles due to competition with lower-wage countries (Manning, 2004).

Globalisation is usually taken as an alternative explanation for changing skill demand and incorporated in skill bias theory. However, in affluent economies, global competition and offshoring is seen to affect primarily low skilled workers and thus tilt the occupational structure upwards, increasing the number of high skill jobs which are seen to be safe from the impact of globalisation (Oesch, 2013). International trade and computerisation are seen to have a similar impact because they allow routine tasks to be either automated or offshored in contrast to jobs requiring complex decision-making or human physical presence. Following this reasoning, skill biased technology theorists expect offshoring to have the same polarising impact as technological change on employment structure and the quality of jobs (Goldin and Katz, 2008)

To sum up, skill bias theory sees that highly educated professionals and managers performing more cognitively complex tasks, which require social interaction, are safe from the potential deskilling effects of computer technology or global international trade. Moreover, the third industrial revolution actually fosters and creates high skilled jobs, in which graduates utilise their acquired knowledge and skills. The information revolution of the modern age is therefore seen to trigger the race between education and skill biased technology which, by

demanding more skills, increases inequality of incomes between skilled workers and non-skilled workers (polarisation) unless there is parallel investment in education to meet the demands of new technologies (Goldin and Katz, 2009). Accordingly the increased supply of graduates in the labour force would reduce the polarisation of job quality at least in terms of income (Goldin and Katz, 2008). This dynamic is seen to be the driving force of higher education expansion.

2.1.1.1 The link with human capital theory

Although generally focused on the problem of the wage premiums educated graduates receive compared to non-graduates, human capital theory (Becker, 1993) is also understood as the “progenitor” of the skill bias theory (Lauder, Brown, and Cheung, 2016). This theoretical position also sees investment in the human capital as being induced by technological progress (see the analysis of Becker’s early works in Lauder et al., 2016) and as a social and economic mechanism to address the demands of skill biased new technologies. Although discussing human capital in terms of skills, what it actually almost always meant in the human capital literature was skill acquired through education, or in rare cases on-the-job training (Baker, 2014). In human capital theory, education represents an investment in the future by which individuals can increase their productivity and private returns by obtaining skills in formal education or on-the-job training (Becker, 1993). Education is essentially understood as a function of the desire for higher economic productivity increase (marginal productivity), which is always operationalised in the application of the theory as equal to the relevant wage rate (Lauder et al., 2016).

Both skill-biased theory and human capital theory therefore assume a direct causal linear relationship between education, technology, productivity and finally wages, in that particular order (Lauder et al., 2016). Higher education graduates are, following this argument, more productive than non-graduates and therefore receive higher wages for their productive

potential. Ever more productive work induced by skill-biased technologies therefore requires more and more productive workers, who are educated in the higher education sector. All these reasons are implicitly seen as contributing to the expansion of tertiary education and are often used as policy rationales for increased investment into higher education by states, firms or individuals.

2.1.2 Empirical and logical deficits and critique

This functionalist theories of the relationship between education and the economy, in skill-bias technological change theory and human capital theory, are considered by some to be “theoretically weak” (Baker, 2009, p. 181) and logically inconsistent.

For instance, in their critique, Lauder, Brown and Cheung (2016), following Piketty, 2014, point out that work in professional services cannot be evaluated in terms of productivity as understood in the same way as in manufacturing, in Fordist terms as a repetitive set of tasks. Similarly they ask if wage premiums in the top one per cent of income distribution can really be understood as rewards for higher productivity in terms of human capital theory (Brown et al., 2012; Lauder et al., 2016).

There are logical deficits in the key causal assumptions of these theories. This association between higher wages and a higher level of education was enough for human capital theorists to assume that if market forces chose workers with higher productivity then education must be the main causal factor (Baker, 2014).

However its main deficits are empirical. Meyer and Schofer (2005) analysed empirical research in the area (Meyer, Ramirez, and Soysal, 1992; Morris and Western, 1999; Windolf, 1997) to conclude that there are very weak links between industrialisation or economic development and the expansion of education at any level, and there is no strong causal link between changes in job or occupational skill requirements and the expansion of higher education. They also saw that previous research has not provided strong support for

technology-driven increases in the demand for skills (Morris and Western, 1999, p. 34, cited in Schofer and Mayer, 2005). Their own regression models, however, find some support for the argument that “economic development tends to have a positive effect on enrolments, but the effect is not significant in the early part of the (20th) century or in models with improved measures that control for secondary enrolments” (Schofer and Mayer, 2005, p. 916). They also examine the relation of higher education expansion, technological innovation and the size of the scientific labour force (using indicators of patents per million capita and the number of scientists in R&D per million capita) finding that none of these variables is associated with higher education expansion (Schofer and Mayer, 2005, p. 914). Finally from their work it can be concluded that higher education expands everywhere regardless of high technology, innovation or the existence of a knowledge-based economy. Some support for this view could be seen from Chapter 1, that the expansion of higher education in Europe and globally continues, although if Lauder et al (2016) are correct then the motivation to achieve higher incomes may be absent. In this way, higher education expansion does not appear to be related to motivations related to the assumed wage premium that graduates receive.

Furthermore, Edgell (2011, p. 64-68.) raises fundamental criticisms about Bell’s assumption that links the rise of the service sector with an increase in the demand for highly educated workers. He points to four major criticisms:

The first, is the idealisation of service work based on conditions in the most prestigious parts of the service sector (research, public service etc.) while neglecting the vast majority of service sector (e.g. call centres). The second is the underestimation of routine white-collar work through the process of computerisation, which is similar to the thesis of deskilling and digital Taylorism (Brown et al., 2012) outlined in the next section on competition and conflict theories. Third is the neglect of the gender dimension of work in post-industrial society with women

being employed in different, less secure, lower paid and more deskilled jobs within the service sector.

The final criticism of skill-bias technology theory is its neglect of the global dimensions of the process of the distribution and differentiation of labour and the elitist competition for talent. Skill bias theory takes into account globalization but assumes that it only affects lower skilled workers, rather than having an impact on knowledge workers.

These theories assume that the supply of graduates responds to the demands created by technology, and here the direction of causation flows from the labour market to education, which then responds to this demand. However, there is an alternative theory that sees the direction of causation differently. In the neo-Institutionalism of David Baker (2014) it is education that creates the demand for high skilled workers but also changes the nature of the work they do.

2.1.3 New institutionalism and education ideology

New institutionalism is a group of heterogeneous theoretical approaches in organizational science, sociology, economics and political science, which have diverse research programmes and methodologies (Immergut, 1998). This theoretical approach emerged as a critique to behaviorism and rational-choice models in the economic theory. The new institutionalism in organization theory and sociology rejects of rational-actor models which explain social action and behavior as aggregations or direct consequences of individual's attributes or motives, and places the central explanatory focus on institutions understood as supra-individual cultural, organizational and cognitive units of analysis, which structure the social world through norms, rules and other frameworks and shape the behavior of agents (i.e. people, organizations, governments) (DiMaggio and Powell, 1983).

The application of institutionalist approaches to education originates from an influential paper published by John W. Meyer of Stanford University (Meyer, 1977) and its most recent form represents the work on schooled society by David Baker.

Neo-institutionalism sees education as the primary social institution that transforms societies culturally, politically and economically into schooled societies (Baker, 2014). The concept of the schooled society, in its positive world outlook, is similar to the concept of post-industrial or knowledge society professed by Bell (1976) and the knowledge economy as understood by skill-bias technology theorists. However, its roots are seen not in terms of education responding to the demands of technology and large bureaucracies but rather as a result of the unique education ideology which has emerged from the education sector itself. This comprises the following: 1) Belief in equality of opportunity and social justice, seen as access to the opportunity to achieve; 2) Belief in the development of the individual as a collective good (beneficial for society); 3) Belief in the dominance of academic knowledge; and 4) Belief that a diversity of academic degrees is synonymous with a diversity of specialised knowledge and expertise (Baker, 2011, p. 11-13).

Neo-institutionalism sees the knowledge society as the product of educational expansion and the institutionalisation of educational credentialing as the only legitimate form of status attainment in post-industrial society (Baker, 2011, p. 11). In general, a knowledge society is seen as a society in which work is upskilled in real terms because more educated workers transform the nature of many jobs and create previously unknown forms of knowledge intensive occupations.

In terms of this approach, higher education not only trains and educates students, but also transforms understandings and expectations of peoples' capabilities, the nature of work in terms of the mass professionalization of work itself, and changes understanding about what constitutes usable and economically valuable knowledge (Baker, 2014).

Institutional theory offers a response to the empirical problems associated with the view that expansion occurs regardless of trends in economic development in various national settings. In this theoretical view, expansion is seen as a result of shifts in the global ideological system and as a reflex of four key world-level dynamics that strengthen the view that an increasing number of social and economic roles can only be performed by highly educated individuals. According to Schofer and Meyer (2005) these shifts can be outlined as follows: (1) democratization and the development of human rights norms and movements which see the exclusivity of higher education for only some groups as problematic; (2) the scientification of almost all spheres of life and human activity; (3) the post-war rise of the manpower and social planning with the related ideology that everyone's productivity can be increased by more education; and finally (4) the structuring of the world polity and global ideological systems of many international governmental non-governmental organizations. For this thesis, the most interesting argument is that the global ideological shift after WWII, concerning the ideal model of society, benefited from the expansion of higher education, and that the attainment of higher education degrees became a social norm, or in other words, became institutionalised. The social purpose of higher education started to be seen not only as for the education of national elites or national occupation systems, fitting people into static "closed" models of society and the labour market (similar to the modernist Humboldt and Napoleonic models of the university). Instead, the world view that education in general benefits individual and collective human capital, as well as fosters national socioeconomic progress, became dominant (Schofer and Mayer 2005, p. 902).

The institutionalism argument finds strong support in Schofer and Mayer's (2005) analysis, which finds a strong correlation between higher education expansion and the index that measures the connection of countries to world society (made up of composite indicators taken as proxies for the processes of democratization and scientification). One should of course

be careful in the interpretation of these correlations and not give them causal attributes. However, the institutionalism argument seems to be a plausible answer to some of the empirical problems of both consensus and conflict and competition theories, especially concerning the fact that expansion seems to be a global phenomenon present in various nation states, regardless of their economic development, which might be delayed (due to historical factors like colonial history or a communist model of government) but not stopped altogether.

2.1.3.1 Educational credentialing, job upskilling and flattening of occupational hierarchies

In line with the view that education cannot be considered as secondary, but is instead a primary social institution, the relationship between education and work is understood as transformative (Meyer, 1977) in that education and increasing levels of educational attainment in populations have a transformative impact on other social spheres like health, politics and work. This approach assumes that education has a pervasive culture, resulting in added-valued learning and skills, which in effect change the nature of work, organisations and occupations. The mechanism by which this is achieved is named *educational credentialing* (Baker, 2011). Educational credentialing is formally defined as close attribution of skills and competences to education credentials in a mediating process by which education as an institution has an influence on society (Mayer, 1977; Baker 2011). Credentialing is a form of power distribution by means of education (Baker, 2011, p. 13). The result is the legitimate and controlled distribution of social resources and power, which are now placed in formal bureaucratic and technologically rich organisations employing professional staff (Baker, 2011). The key support for this claim is seen in the decline of the importance of non-educational credentials like direct family inheritance and family based apprenticeships (Collins, 1979).

The principle impact of credentialing in the world of work can be also seen in shifts in occupational hierarchies and staffing practices, which results in the horizontal and vertical institutionalisation of credentialing. These are the processes by which the use of education

credentials for access to jobs spreads across different occupations and different job types within an occupational group (Baker, 2011). This process is not seen purely in terms of raising the formal entry criteria, as in the credentialism scenario of competition and conflict theories. Rather, in the view of neo-institutionalism, it implies that educated workers with credentials, in interaction with their employers, slowly but substantially transform the content of many occupational and staffing categories so to better suit their skills and work styles e.g. greater work discretion.

Similarly, from a more empirical line of thought, Teichler (2009) points out that in the situation where an increased number of higher education graduates are leaving universities and entering occupational structures, some of them inevitably end up in positions not previously typically occupied by graduates. In such situations, he claims, the dominant process that occurs is the gradual upgrading of definitions of these occupations because educated workers transform employers' expectations of what they are capable of. The macro result of these processes should be the adjustment of occupational structures by the flattening of hierarchies in terms of job demands and skill requirements and the general up-skilling of work across job types. Following this argument would imply that an increase in the number of graduate employees would, for instance, lead to higher skill utilisation and/or work autonomy because highly educated workers are able to do tasks without much supervision. On the other hand, it remains unclear whether the process affects overall job quality and whether these people are rewarded with the same level of job security and flexibility, employment conditions and wages.

Baker (2011, p. 9) identified two sets of relatively scarce research which support the argument that education does indeed change work and occupational hierarchies, among which was the research of Howell & Wolff (1991) that found a significant rise in complexity, cognitive demand, and analytical reasoning in jobs across 264 occupations and 64 industries in the USA from 1960 to 1985.

To sum up, the neo-institutionalist approach predicts that companies adapt their profit seeking strategies and the occupational content of many jobs to the skills and work habits of more capable educated workers (Baker 2014, p.128). It implies that allowing more educated people to use their abilities is beneficial to the firm as much as to the individual. Hence, jobs will change in order to accommodate these better educated employees through some combination of job redesign and/or capital investment (for example, by purchasing new technologies suitable for graduate skills). As the educational attainment of the labour force grows, this process would eventually lead to a flattening of occupational hierarchies in terms of job demands and skill requirements and a general up-skilling of work across job types (D. Baker, 2014; Teichler, 2009).

2.2 Conflict theories

The second group of theories that addresses the expansion of higher education some authors name conflict and competition theories (Schofer and Mayer, 2005). This points to the view that mass higher education is seen as a form of social class stratification, which in the work of Brown, Lauder and Ashton (2011) extends from a global higher education competition to the global labour market. Schofer and Mayer (2005) see the role of class stratification and higher education within nation states. Here they consider education as a secondary (auxiliary) social institution, which feeds the process of social stratification on a seemingly meritocratic and legitimate basis. In this theoretical scenario the purpose of education is primarily to reproduce social order and it is understood as a way for individuals, groups and classes to attain social status. The competition for social status through education, in this theoretical view, creates credential inflation and a general expansion of education beyond original functional requirements (Bourdieu, Passeron, and Nice, 1977; Collins, 1979). This theoretical line claims that in societies in which status competition is high or in which various subgroups have competing interests, the expansion of higher education would be greater (Schofer and Mayer,

2005). One can also argue the opposite, namely that in a situation of increased competition groups in power limit access to education streams, leading to prestigious occupations and higher social status. As the typical example for this case, the author often uses the case of European communist countries and the restriction of access to higher education, resulting in the slowing down of higher education expansion after the 1970s (Baker, Köhler, and Stock, 2007). It is interesting that the regression models of Schofer and Mayer (2005, p. 912) based on time series modelling show little support for the former argument but stronger support for the latter. Naming the USA, South Africa, and Sri Lanka as examples, they claim that higher education expansion is slower in more diverse societies than in those that are more homogeneous, supporting the hypothesis that powerful social groups can be successful in limiting the participation of others. Despite their use of some convincing country examples, it is very hard to make generalizations in support of the basic version of competition and conflict theories of educational expansion. The stratification function of higher education exists without doubt, but it is problematic to see educational credentials solely in terms of their role in social conflict and stratification, and in determining who is successful in the job market, rather than also in relation to economic development.

Nevertheless the major theoretical contribution of these theories is the introduction of social stratification as a factor which determines the nature and quality of jobs available to higher education graduates. The status-distributive function of education, including higher education, by which individuals gain access to certain occupations, which lead to a certain extent to monetary resources and social recognition, is emphasised within this theoretical approach. Consequently the relationship between higher education and the world of work is seen primarily as that of positional competition, in which the social and cultural capital of individuals is strengthened and legitimised through educational qualifications because appropriate qualifications from elite institutions enables entry to desired professional and

career paths. The higher education graduate is in this approach seen a status seeker and the allocation of individuals to specific occupations and jobs in the labour market is seen as a process of social reproduction, while education is largely considered a “myth”.

2.2.1 Signalling theory

Signalling theory is one of the labour market theories in this tradition, which conceptualises education primarily as a sorting mechanism (Spence 1973; Stiglitz 1975). It is often seen as a variant of human capital theory, but when placed in the context of the stratification theories discussed above, it can be interpreted as a means of selecting and sorting graduates for the labour market according to social class background and university attended. Signalling theory argues that education does not really increase a worker’s productivity, as education and qualifications serve only to signal and identify ability in a situation of unbalanced information between workers and employers. Here, then, employers are using education qualifications as a screening device in the face of the vast numbers of graduates searching for work (Holmes and Mayhew, 2015). Employers do not have sufficient information about the productivity potential of future employees so they look for signals as to which potential workers will learn the job more quickly and perform well thereafter. Education attainment is seen to be one such signal (Spence, 1973; Thurow, 1975). Higher education expansion is therefore driven implicitly by positional competition, because future workers are incentivised to acquire more education than their potential rivals in the labour market for the available number of good jobs (Holmes and Mayhew, 2015). The theory does not question higher wages as a result of higher productivity, but does however question education based skills as determinants of higher productivity.

2.2.2 Qualification inflation, credentialism and overeducation

The classic text that supports most of the “education as a myth” (Baker, 2014) concerns about educational expansion is Ronald Dore’s book *The Diploma Disease* (Dore, 1976). Dore

paints a grim picture of the changing relationship between education and work. The first element of this picture is qualification inflation and credentialism. In the situation in which there are ever more graduates with education credentials, the job-seeking competition becomes fiercer and as a result job-seekers have to increase their level of education, which is verified through educational credentials (Baker, 2009, p. 168). This argument is in its essence the same as the problem labour economists call *education upgrading*, meaning that instead of *skill upgrading or upskilling* of jobs (seen in the perspective of skill-bias technology theory), the credentials required to get the job are upgraded without actually changing the work content. Based on the signalling theory approach, this is seen as “skill-less” educational upgrading, and as such considered inefficient and wasteful because it leads to overeducation.⁶

Acquiring a signal to compete for access to job opportunities is seen as a zero sum game - when one person improves their position, somebody else is made worse off. It is understood that this game does not add to productivity and is therefore potentially costly to society (Spence, 1973). In such circumstances costs may be substantially lower if, for example, someone choose not to attend university or maybe to attend apprenticeship training (Holmes and Mayhew, 2015). Similarly the preference for more academically prestigious institutions or study programmes can be understood as status seeking for the purposes of competitive benefit and not because substantially different knowledge and skills are acquired at these institutions or programmes.

In the scenario in which education is seen as a positional game where participants place themselves ahead of others by obtaining more credentials, the first consequence of higher education expansion on workers will be that once they start working they discover that they do not use much of the knowledge and skills they have obtained in formal education (low skill utilisation). Secondly, those graduates who lose in the competition for better jobs get lower

⁶ Economists largely discuss and describe this problem as overeducation (and some also the upgrading of educational entry requirements) It is claimed not only to have costly consequences for individuals (Duncan and Hoffman, 1981; Groot and Van Den Brink, 2000; Hartog, 2000), but also for firms (Tsang, 1987) and by the whole economy (Maier, Pfeiffer, and Pohlmeier, 2003; McGuinness, 2006).

quality jobs, further down the occupational hierarchy, in positions previously occupied by non-graduates, which require lower levels of skill. Non-graduates in such circumstances would be pushed out of jobs by graduates, who would have higher chances of finding employment because employers would be faced with an increase in the number of better educated applicants from which to choose, over less educated contenders, although both type of workers would be perfectly capable of doing that work (Holmes and Mayhew, 2015). In other words, from the perspective of this theoretical approach, higher education graduates who found themselves in occupations previously occupied by non-graduates, would be penalised by even lower skill utilisation than graduates in managerial and professional jobs, but might also suffer penalties in other job dimensions like security, work autonomy or income. Thirdly, this theoretical scenario envisages, as the last stage of the competition, after the number of graduates applying for non-graduate jobs becomes too high, that companies would also raise the formal entry requirements in terms of minimum credentials for certain occupations (Warhurst and Thompson, 2006).

This discussion introduces complexity in the understanding of the relationship of education to access to the labour market. It challenges the assumption that there is a simple causal relationship between education, skills and productivity in the labour market and as such this group of theories is important to consider when examining the distribution and job quality of graduates.

2.2.3 The theory of global knowledge capitalism

The theory of global knowledge capitalism is one of the most recent theoretical contributions to the group of conflict and competition theories. It seeks to understand how jobs are distributed in terms of their quality, not only nationally but globally (Brown et al., 2012). This theory emphasises status competition, but without fully dismissing the issue of attained education skills for productivity, as the signalling and credentialism theories do. In contrast to

versions of positional competition theory (such as signalling and credentialism theory) which only explain why some lose or win in the graduate labour market, this theory tries to understand how information technology and globalisation shape the global competition for jobs and how job quality is vertically differentiated in the global labour force.

The theory questions two dominant views held by skill-biased technological change theory and human capital theory: 1) that at least in the developed world there is a global knowledge-based economy, driven by the application of new technologies that accelerates the shift to high-skilled and high-waged employment. 2) that globalisation and technology foster the creation of good high-skilled jobs in the affluent world, as they have comparative advantage in terms of higher education attainment, while low skilled jobs will be auctioned on price and will migrate to the low-wage economies of Asia and Eastern Europe (Brown, Lauder, Ashton, 2011; Yingje, and Vincent-Lancrin, 2008).

The theory of global knowledge capitalism sees that the ideology of ‘the war for talent’ which in the globalised economic institutional order creates an intense global positional competition leads to the process of fragmentation of the labour market (Lauder et al., 2016, p. 26) in which there is no direct relationship between higher education degrees and entry to professional and managerial occupations. Instead, graduates have to prove their talent with ever more prestigious degrees and demonstrate their suitability with a wider range of talent signals like extra-curricular activities (Brown et al., 2011). The authors argue that the combination of globalisation and technology makes this competition even fiercer but also allows for the global segmentation of the labour markets in terms of job quality. The key mechanism of this interplay between globalisation, modern technology and job quality they name digital Taylorism.

Knowledge and highly skilled work is seen not to be immune to the potential deskilling effects brought by computer and information technologies and globalisation, as skill-bias technological theory assumes. Professionals and managers are traditionally seen as

autonomous knowledge workers, and as such immune to deskilling tendencies or even as even as profiting from the deskilling of jobs in other occupational categories in the process of skill-polarisation. Authors writing about global knowledge capitalism see that work in occupational groups like professionals, managers and technicians, traditionally seen as knowledge intensive (and employing persons with higher education degrees) is becoming increasingly standardised, segmented and reutilised under the influences of digital Taylorism characteristic of global knowledge capitalism (ibid, p. 72). Digital Taylorism involves the transformation of the knowledge of knowledge workers by “capturing, codifying, and digitalising their work in software packages, templates, and prescripts that can be transferred and manipulated by others regardless of location” (ibid, p.72). Similar to the mechanical Taylorism that was based on the scientific management principles characteristic of industrial capitalism, knowledge capitalism is seen as industrialising work in the services industries by translating work routines that usually require a higher degree of competence. In this way companies reduce cost, increase control and alienate knowledge work from the worker, making it the property of companies and not of individuals (ibid, p. 76). The final prediction Brown, Lauder and Ashton make about the future of knowledge work is that of increasing functional vertical stratification within knowledge work and workers. Knowledge workers are seen to be grouped into categories of: 1) developers, seen as top creative performers including senior researchers, managers and some professionals; 2) demonstrators, being in charge of the implementation and execution of existing knowledge, procedures or management techniques, while involved also in communication with colleagues and customers; 3) drones, doing monotonous work in jobs like call centres or data entry (ibid, p. 81).

In this way globalisation and technology explain the variation in returns to graduates in terms of job quality. Very few graduate jobs are seen to belong to the elite group of developers and they are usually students from elite universities in elite transnational corporate

jobs, who are considered 'talented' and receive a similar order of compensation to leading executives (Lauder et al., 2016). The quality of jobs of masses of others (demonstrators and drones) globally, including in the affluent economies, is seen increasingly to be stagnating in terms of wages and deteriorating in terms of skill utilisation and a lower degree of work autonomy, due to the deskilling effects of new technologies. As Lauder et al (2016, p. 24) nicely point out : "Digital Taylorism is not simply creating a polarization between high and low skilled workers, but the segmentation of knowledge work and of middle class occupations, where the benefits of productive growth are concentrated in the hands of executives and senior personnel, especially when combined with a shareholder approach to corporate governance. The irony is that without the introduction of new information technologies the global auction for high skilled, low wage work would have been impossible. These are some of the factors that have led to the fragmentation of the labour market and they cannot be explained in terms of skills and skill shortages but require a much broader understanding of the political economy of the changes underlying the labour market". (p.24)

The authors support their claims with three kinds of evidence. One concerns the recruitment practices of multinational companies which tend to employ well paid core workers in engineering and design in their headquarters who receive all kinds of benefits including high incomes, while they offshore many professional usually casual jobs at a far lower price (e.g. of software development companies) (Brown et al., 2012; Lauder et al., 2016). The second is the analysis of wages in the USA across time, decomposed into quantiles which indicates that there is a wage premium only in the top quantile of graduate jobs while wages stagnate in other quantiles (Lauder et al., 2016). Finally, they draw on the quantitative analyses of the supply demand for high skilled jobs in the USA and UK ((Beaudry, Green, and Sand, 2014, 2016; Holmes and Mayhew, 2015) which at least for these two countries suggest that demand for the highest skilled jobs is declining, especially for new graduate entrants to the labour market.

2.3 Labour market institutions and job quality

The aforementioned theoretical approaches represent universalistic theories which from different perspectives try to explain patterns of distribution of graduate job quality in the context of technological change, globalisation and higher education expansion. Dynamism of change in job quality, especially trends towards polarisation and overall deterioration in work conditions and rewards is almost always explained by global trends which function irrespective of national macro regimes (Brown et al., 2012). However, it would be naïve to consider that these trends alone explain why graduate job quality distribution in specific countries, and/or sectors of the economy, or across occupations, are solely influenced by these broad trends. The missing pieces of puzzle are labour market institutions that mediate the extent of influences of global trend and forces that impact job quality, but also determine to some extent the variance in job quality among different countries. Minimum wages, collective bargaining rights, employment protection, education and apprenticeship systems, welfare provision and childcare arrangements all affect the quality of jobs created in an economy, what types of jobs companies offer to graduates and decisions of graduates whether or not to take these jobs. For instance, the deskilling impact of technology might be worse in countries where there has been an erosion of trade unions. The specific groupings (types) of these macro socio-economic features existing at country level are usually referred as macro institutional regimes. However, they are conceptualised in different ways depending on the analytical perspective taken: here we can identify three key theories or perspectives: the varieties of capitalism (Hall and Soskice, 2001; Iseke and Schneider, 2012), welfare regimes (Esping-Andersen, 2013) or distinct employment regimes (Gallie, 2008). The varieties of capitalism analytical perspective (Hall and Soskice, 2001), for example, sees differences in job quality as reflexes of differences in industrial relations and labour market regulation (coordinated more regulated and unionised systems vs more market driven liberal systems) and of educational systems (vocational vs more general

oriented education systems). Coordinated market economies with strong labour market regulation and vocationally oriented education systems are seen to provide in general a better quality of jobs than liberal systems in a variety of aspects (Gallie, 2008).

These theories will also be employed to help explain particular country variations that are not captured in the high level universalistic theories discussed above.

2.4 Job quality – the concept and its dimensions

In the introduction to this thesis it was argued that in order to better understand the quality of overall employment and work arrangements in graduate jobs one must look beyond the occupational categories in which graduates find employment. Similarly, focusing on only one dimension of job quality like wages or the match between skills acquired through education and work requirements obscures other important elements of the job. The crucial question here is what constitutes a good or a bad job and only based on this can we choose indicators which measure this construct.

For instance, one long time one school of thought usually linked with the utilitarianism of neo-classical economics and the theory of compensating differentials (Green, 2006, p.9) was that in order to know what kind of jobs are being generated in modern economies, one need to look only at wages, assuming that these would be positively correlated with other favourable working conditions, so that the wage structure would not differ greatly from more the detailed picture of job quality (Green, 2006, p.8). In this tradition, which Green (2006) terms subjectivist, a job is understood as an exchange of specific obligations and preferences in terms of invested time, effort and duties for wages and other benefits (Green, 2006). Job quality is understood in terms of the extent to which a job fulfils an employee's rational economic preference, leading to the so-called "matching process" between workers' preferences and the working conditions offered by employers in a competitive labour market where workers with the least aversion to poor working conditions gravitate towards firms that would find it most

costly to improve conditions (Green, 2006. p.9-10.) This explains why wages are seen as a key indicator of job quality, because high wages enable greater consumption, as well as compensating for potentially poor working conditions. In this approach higher pay implicitly acts as the incentive to attract workers to less attractive jobs.

Other approaches to the question of what constitutes job quality, linked with more sociological and psychological understandings of the work place, put skill and work autonomy at the centre of the debate on the quality of work. Following the Marxist principle that understands humans as conscious, productive creatures able to plan and execute activities, skill is a concept valued as the essence of humanity (Green, 2006, p. 12). According to this principle any de-skilling of human work through increasing differentiation of tasks or separating planning from the execution of tasks by increased external management and control is seen as a dehumanising activity, or in terms of the alienation of humans from their very nature. Accordingly, measures promoted mostly via research in occupational psychology that increase autonomy, such as planning and execution, skill acquisition, trust, health and safety, and the promotion of worker involvement in decision making, have usually been seen as humanising work and consequently improving the quality of working life (Green, 2006, p. 12). Instead of taking only wages as the measure of job quality, the sociological and psychological tradition often emphasizes overall job satisfaction as the key indicator, which is linked to productivity and which most of all predicts mobility (changing jobs) in the labour market.

The approach typically adopted in sociological and psychological research assumes that objective features of the job are the predominant cause of employee experience and that some objective job features (e.g. job discretion, good skill utilisation, high wages, permanent full-time contracts etc.) will (regardless of the individual preferences) fulfil basic human needs (e.g. autonomy, sense of purpose, affiliation, security – emphasised in sociology) and that this will lead to psychological and physical well-being (emphasised in occupational psychology).

Regardless of disciplinary traditions, the central assumption of the concept of job quality is that specific work and employment features have beneficial outcomes for the employee and others do not. Consequently, the understanding of the concept of job quality used in this thesis follows the definition proposed by Green (2006): **Job quality is the extent to which a job has work and employment-related factors that foster beneficial outcomes for the employee, particularly psychological well-being, physical well-being and positive attitudes such as job satisfaction** (Green, 2006; Warr, 1990).

Theoretically this approach is anchored in the functioning-capabilities philosophy of Amartya Sen and Martha Nussbaum (Nussbaum, 2011; Sen, 1993, 1999) and their radical reconceptualisation of the concept of human and national well-being. The central question they pose, considering the various aspects of human life in which people act, is what a life worthy of human dignity requires? In their answer, they provide a list of ten central capabilities each government (assuming that it is the task of governments) or society aiming for the welfare of their citizens must secure as a bare minimum: life, bodily health, bodily integrity, use of senses, imagination, thought and knowledge (right to education and skills to produce work), emotional attachment to others, use of practical reason (e.g. in planning own life), affiliation with others, ability to respect other species, and finally control over own political and material environment (Nussbaum, 2011, p. 33-34). Following Green (2006), this research operationalises the philosophical approach of Nussbaum and Sen to the question of work in human life by identifying five key indicators of job quality, understood as job characteristics that allow individuals to realise their central human capabilities in work, and indirectly in life:

- A) Skill utilisation – capability to use thought, knowledge and skills to do meaningful work;
- B) Work autonomy - control of own work environment with discretion to determine content, method and pace of own work;

- C) Income - earn enough to enable acquisition of sufficient material resources for a healthy and lengthy life and control own material environment (provide a home, for example);
- D) Job security – capability to plan own life
- E) Work-life balance – capability to emotionally attach to others, reproduce, play and affiliate in society (work-life balance).

Although all five dimensions in theory contribute to overall job quality and to a positive feeling of job satisfaction⁷, two dimensions of job quality can be considered especially important for graduate workers, given their substantial educational investment and the nature of their work: skill utilisation and autonomy in planning and execution of tasks. These two aspects are exactly the aspects that are idealised in the concept of the prototypic graduate worker as a professional. Skill utilisation and level of work autonomy will be job quality dimensions emphasized in the course of this research because they are central to theoretical considerations of how new computer technologies and globalisation influence graduate work.

Good graduate jobs are, according to this thesis, understood to be jobs that allow these central human capabilities to be achieved and fostered. It is obvious that not all graduate jobs allow these capabilities to be fulfilled to an equal extent and that a number of individual and social factors (such as the introduction of new technologies, globalisation, employment regulation and job design etc.) influence their unequal distribution. Unlike the bulk of other research on this topic, which tries to explain differences in job quality in terms of the simple logic of demand and supply mismatches (hence the potential problem of overeducation, non adequate education or skill provision, wrong job design etc.), this research aims to uncover its

⁷ The next Chapter 3 discusses measurement of job quality detail, including the availability of indicators for different dimensions in empirical social surveys, approaches to measurement of job quality and the individual weighting of these dimensions in overall job quality.

much deeper roots, and to outline how the interplay of individual characteristics, particular job characteristics and sectors of employment influence these differences (Chapter 4).

3 Measuring graduate job quality

Comparative research on the job quality of higher education graduates requires a conceptual understanding and related measurement that travels across borders, allowing sensible comparisons without losing too many individual and national-specific characteristics. The development of the European employment policy faced this problem much earlier, and driven by the rhetoric of the EU's "more and better jobs"(e.g. Kok & others, 2004) seems continuously to seek a suitable quantitative measure of job quality. Only through the simultaneous measurement of both the quantity of jobs graduates undertake (more jobs) and their quality (better jobs) can one grasp the potential trade-offs between these dimensions of employment and establish empirical support for the existence of different employment regimes in terms of quantity/quality trade offs (Gallie, 2008; Munoz de Bustillo, Fernandez-Macias, Esteve, and Anton, 2011).

This chapter discusses different approaches to the problem of job quality measurement as a multidimensional construct and subsequently presents a concrete model for the establishment of a graduate job quality index based on the combined REFLEX and HEGESCO graduate survey data.

3.1 Graduate job quality: Dimensions

There is a wide understanding in the literature that job quality is a multidimensional concept. However, the understanding of the nature and importance of various dimensions remains a battlefield of different theoretical traditions which argue without a definite conclusion.⁸ This research adopted a definition of job quality as the sum of work and employment conditions related to particular jobs, which to different extents fosters beneficial outcomes for the employee, including psychological and physical well-being, as well as

⁸ The theory behind the concept is a part of the theoretical Chapter 2 and this paper only addresses the measurement issues.

positive attitudes like job satisfaction, commitment and turnover intentions. (Green, 2006; Hauff and Kirchner, 2014; Holman, 2013).

The measurement process was limited to some extent by the common data sources that provide information on different dimensions of job quality. The most prominent sources used in the development of comparative job quality measures for both policy and research purposes are the European Working Conditions Survey (EWCS) and the work orientation modules of the International Social Survey Program (ISSP). Both sources focus on the general labour force and cannot sensibly be used for the purposes of in-depth research on specific subgroups such as higher education graduates. Data for measuring the job quality of higher education graduates for the purpose of research are usually based on the national graduate surveys, or in some cases on international graduate surveys like the REFLEX and HEGESCO surveys which were conducted in more than 20 countries in 2005 and 2008. The conceptual discussion on job quality in the previous chapter theorised the potential impact of different dimensions of job quality (work autonomy, job content, job risk, wages, work life balance etc.) and their influence on overall positive outcomes of job quality (physical and psychological well being or job satisfaction). However, there is no general agreement about the content of a list of dimensions of job quality. Disagreement about the dimensions of job quality becomes clearly visible in the comparison of different studies on cross-national differences and trends in job quality using the aforementioned datasets (Hauff and Kirchner, 2014). The Table 1 below has been adopted from Hauff and Kirchner (2014) and modified to include the dimensions present in both the REFLEX and HEGESCO datasets and some of the studies addressing job quality measurement with regard to higher education graduates. The overview of studies based on EWCS and ISSP data shows that even when using the same data, different authors analyse different dimensions of job quality. The measurement of graduate job quality has been until now focused either on mostly descriptive accounts (Allen and Van der Velden, 2011) or on only some of the

dimensions of job quality and labour market outcomes like wages, job satisfaction, overeducation (Allen and Van der Velden, 2011; Salahodjaev, 2015; Sánchez-Sánchez and McGuinness, 2013; Tomasz Gajderowicz, Gabriela Grotkowska, and Leszek Wincenciak, 2014). Occasionally, authors are more ambitious and experiment with graduate job quality indices using national graduate survey data from Flanders (Schokkaert, Van Ootegem, and Verhofstadt, 2009) and Italy (Bocuzzo and Gianecchini, 2014) or most recently national surveys on workplace relations (Holmes & Mayhew, 2015).

The only dimension used in almost all studies (except the graduate job quality index of Bocuzzo and Gianecchini) is job autonomy. For example, REFLEX and HEGESCO surveys provide information about graduates' self-assessment of work autonomy as well as information about the extent to which they can "set the goals for own work" and "decide how they do own job". Previous overviews also conclude that in some studies authors use all available variables within a dimension, while some omit some of them (Hauff and Kirchner, 2014). Other dimensions used in the majority of studies are task variety, physical and intellectual demands, wage level, skill utilisation, development and training opportunities as well perceived job security and type of contract. Dimensions that are relatively rarely used and/or not available in all data sources are: involvement and engagement, clear formulation of tasks and responsibilities, emotional demands, teamwork demands, meaningfulness, social relations at work, ambient demands, workload, type of payment, workplace features and job fairness (issues like discrimination etc.). Dimensions like professional leadership, responsibility, and ethical demands are designed only for REFLEX and HEGESCO graduate surveys and there is no strong evidence that they actually contribute to overall well-being or positive attitudes like job satisfaction.

Table 1: Dimensions of job quality captured in EWCS, ISSP and REFLEX&HEGESCO data and their use in different studies Source:(Table adopted from Hauff and Kirchner, 2014 with extension of the overview of graduate surveys

Dimensions of job quality		Availability in EWCS 2005, 2010	Gallie (2007)	Davoine et al (2008)	Smith et al (2008)	Leschke&Watt (2008)	Tangian (2009)	Munos de Bastillo et al(2011)	Holman(2013)	Availability in ISSP 1987,1997,2005, 2015	Clark (2010)	Olsen et al (2010)	Availability in REFLEX 2005 and HEGESCO 2008 graduate surveys	Allen & Van der Velden (2011)	Schokkaert et al (2009) / Flemish data on school leavers (SONAR)	Bocuzzo & Gianecchini (2014) Italian Agora graduate survey
Autonomy	Work autonomy (e.g. ability to set work goals, change order of work tasks, methods of work etc.)	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Dependency (e.g. Pace, results of work depends on others or on own performance etc.)	✓		✓			✓		✓				✓			
Involvement and engagement	Involvement (e.g. extent to which employees are consulted about the changes in work organisation)	✓				✓	✓		✓				✓			
Job content	Clear formulation of tasks and responsibilities	✓					✓									
	Variety	✓			✓		✓	✓	✓	✓	✓	✓			✓	
	Intellectual demands/Complexity	✓			✓		✓		✓	✓			✓	✓	✓	
	Emotional demands	✓			✓		✓		✓							
	Contact and work with others (colleagues, customers) - Teamwork	✓			✓		✓		✓				✓	✓		✓
	Meaningfulness (useful for society)	✓					✓	✓	✓	✓	✓	✓	✓	✓		
Social relations	Relations to/support from management	✓					✓	✓	✓	✓	✓	✓				
	Relations to/support from colleagues	✓					✓	✓	✓	✓	✓	✓				
Working conditions	Physical demands (e.g. carrying heavy loads etc.)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	
	Ambient demands (e.g. noise etc.)	✓			✓	✓	✓	✓	✓	✓	✓	✓				
	Workload	✓				✓	✓	✓	✓	✓	✓	✓				
	Work intensity (high speed, tight deadlines)	✓		✓		✓	✓	✓	✓	✓	✓	✓			✓	
	Responsibility and ethical demands	✓											✓	✓		✓
Wage and payment	Wage level	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	Type of payment (e.g. fixed salary, performance pay)	✓					✓		✓							
Working time and work life balance	Full time vs Part time	✓		✓		✓	✓		✓				✓	✓	✓	✓
	Duration (exact hours/week)	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓		✓
	Scheduling (work at night, shifts, weekend)	✓		✓		✓	✓	✓	✓						✓	

Measuring graduate job quality

		Availability in EWCS 2005, 2010	Gallie (2007)	Davoine et al (2008)	Smith et al (2008)	Leschke&Watt (2008)	Tangian (2009)	Munos de Bastillo et al (2011)	Holman(2013)	Availability in ISSP 1987,1997,2005, 2015	Clark (2010)	Olsen et al (2010)	Availability in REFLEX 2005 and HEGESCO 2008 graduate surveys	Allen & Van der Velden (2011)	Schokkaert et al (2009) / Flemish data on school leavers (SONAR)	Bocuzzo & Gianecchini (2014) Italian Agora graduate survey
Dimensions of job quality	Flexibility (choice of working hours, to take an hour off or to take breaks)	✓			✓		✓	✓	✓	✓						
	Work life balance (having time for family, leisure etc.)	✓				✓	✓		✓	✓			✓			
	Clean boundaries between work and private life	✓					✓		✓							
Skills and development	Skill utilisation	✓					✓	✓	✓	✓			✓	✓		✓
	Development opportunities	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Career progression opportunities												✓	✓		✓
	Training availability and participation	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓		
Job security	Contractual status (type of contract)	✓		✓		✓	✓	✓	✓	✓			✓	✓	✓	✓
	Perceived job security	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		
Workplace	Workplace (working at company, working at home)	✓								✓						
	Distance between work and home	✓					✓									✓
Fairness	Physical violence	✓					✓	✓								
	Bullying/Harassment	✓					✓	✓								
	Discrimination	✓		✓	✓		✓									
Professional leadership	Authoritative source of advice or information for others, professional ethics etc.												✓	✓		
Outcomes of job quality	Physical well-being	✓		✓			✓		✓							
	Psychological well-being	✓					✓		✓							
	Absenteeism	✓					✓									
	Job satisfaction	✓		✓			✓		✓	✓	✓	✓	✓	✓	✓	
	Engagement	✓					✓									
	Commitment	✓								✓						
	Turnover intentions	✓								✓						

When it comes to outcome measures of overall job quality there is a relatively limited choice of variables. The EWCS offers the widest range of outcome variables (absenteeism, psychological and physical wellbeing, job satisfaction, and commitment and turnover intentions), while ISPP offers only three variables, and graduate surveys usually ask only for job satisfaction. Job satisfaction is the most used measure of outcome and effect (not a dimension itself) of the combination of other dimensions of job quality. It is the only one of the so-called outcome variables present in the REFLEX and HEGESCO graduate surveys.

When choosing which dimensions of job quality to include in this study, based on the discussions above the following parameters needed to be taken into account:

- 1) Availability of variables for different dimensions of job quality in the REFLEX and HEGESCO datasets as the only source of comparative data on European higher education graduates;
- 2) Research practice outlined in the previous section with regard to the most frequently used dimensions of job quality considered in the cross-national analysis;
- 3) Research findings and theoretical accounts that positively linked certain dimensions of job quality with greater wellbeing, and positive attitudes like job satisfaction etc. (discussed in the theoretical chapter).

Accordingly, the following dimensions of job quality were considered in the design of the graduate job quality index:

1. Work autonomy (extent to which a graduate can determine the goal and the methods of their own work);
2. Skill use and development (extent to which skills are utilised in the graduate jobs);
3. Wage level;

4. Job security (perceived job security but also as the type of contract);
5. Work life balance (time for leisure activities and family tasks as indirect measure of work time flexibility);

As the only available measure of outcome of job quality, the variable **job satisfaction** was used. Rightfully one should discuss at this point why it was not sufficient to just take job satisfaction as an overall indicator of job quality and avoid modelling different dimensions of job quality into a single comprehensive measure. If the listing of all job quality dimensions indeed had the purpose of identifying job characteristics (input) that have an impact on the wellbeing of workers and their positive attitudes (like job satisfaction) (output), why not concentrate on measuring the output directly? In other words why not use level of job satisfaction as a direct measure of job quality?

Although this solution follows the principle of parsimony in scientific research and would substantially simplify the problem of modelling, measuring and most of all weighing different dimensions of job quality, there were also strong arguments for avoiding this shortcut.

Muñoz des Bustillo et al (2011) offered several reasons. Firstly, the empirical distribution of job satisfaction indicators based on major international social surveys (e.g. ISSP Work orientations 2005) shows that job satisfaction across countries does not correspond with anything previously known about work and employment conditions in specific countries. For example workers in Mexico, Switzerland, Philippines and Ireland have the highest level of job satisfaction overall, yet for instance work conditions in many companies in Philippines or Mexico are far from excellent. The lowest levels are found in South Korea, France and Latvia (Munoz de Bustillo et al., 2011). Secondly, following the previous argument, this indicates that job satisfaction levels are only partially congruent with the job quality level based on objective job characteristics. For

instance there are some studies which show weak and sometimes negative association of incomes and job satisfaction (e.g. Clark, 1998; Clark & Oswald, 1996). Thus, there must also be many other endogenous variables affecting the level of job satisfaction.

The search for potential endogenous variables is relatively easy since job satisfaction is one of the most theorised and researched variables in the social sciences and psychology. There are several major theories of job satisfaction⁹ which focus on explaining the impact of personality traits on job satisfaction (e.g. dispositional theory of job satisfaction), impact by colleagues payoffs (equity theory), work design (job characteristics theory), subjective well-being, theories which see job satisfaction as motivation, etc. One of the major theoretical frameworks that is widely used to explain job satisfaction is the affect theory or discrepancy theory of Edwin Locke (1969, 1970). This sees individuals' job satisfaction as an affect which is based on their subjective evaluation of the existing discrepancy between what they want from their job and what they perceive they get from it (Locke, 1969, 1970). In other words, job satisfaction is the result of a relationship between expectations based on values and the way a job is perceived in reality. In other very cynical words, one could also claim that, following this understanding of job satisfaction, in order to improve job quality one should lower expectations from workers concerning their jobs. More recent accounts of the affect theory (Moorman, 1993; Weiss, 2002) see it as a composite of affective job satisfaction (feelings about the job, including values and expectations) and cognitive job satisfaction (rational evaluation of job characteristics). This implies that hypothetically one can identify rational evaluation of job characteristics, once the values and expectations are known or in statistical terms controlled¹⁰.

⁹ Some of the recent reviews of theories can be found in: Judge, Bono, & Locke, 2000; Kucel & Vilalta-Bufi, 2013; Weiss, 2002).

¹⁰ This approach is for instance applied by the author in the process of further design of the Graduate Job Quality Index.

Furthermore, recent studies also show evidence of the limited cultural grounding of differences in job satisfaction among countries (Hauff, Richter, and Tressin, 2015). These differences might for instance explain why workers in some countries are generally more satisfied with their jobs as Munoz de Bustillo et al (2011) demonstrate previously in the cases of Mexico and Philippines.

Following previous two points, in order to make job satisfaction a suitably objective measure of job quality one would have to at least control for individual expectation fulfilment (which incorporates values about work) and for cultural differences, which is not easy given the limits of the observable variables in the majority of datasets.

The third and final reason for not taking job satisfaction as a sole measure of job quality, offered by De Bustillo et al (2011), is that for policy and scientific purposes the approach is limited, whereas one of the benefits of a composite multidimensional measure like job quality indices is that they are more transparent and can be decomposed, so that a user can better understand which elements of work contribute to the overall scores.

To conclude, job satisfaction can be a very useful variable for contrasting and externally evaluating the results of the potential job quality index because better job quality and better job characteristics do lead to the increased job satisfaction even if they do not explain it fully (Fried and Ferris, 1987; Green, 2006; Hackman and Oldham, 1976; Kucel and Vilalta-Bufi, 2013). This premise also opens the door for the use of job satisfaction as a variable for weighing the contribution of specific job characteristics in relation to the overall job quality, in the case of composite indices. For instance, this approach was taken in the case of graduate job quality index developed later in this chapter. One can namely estimate how much different dimensions of job

quality contribute to the overall job quality by predicting job satisfactions with different job quality dimensions as explanatory variables and using these coefficients as composite index weights.

3.2 Graduate job quality: analytical approaches

Once the dimensions of graduate job quality had been identified, a suitable analytical approach needed to be considered. Different analytical approaches have specific advantages and disadvantages and require different measurement methods. The following section discusses these challenges.

Based on the review of cross-national studies of job quality, Hauff and Kirchner (2014) identify three main analytical approaches: 1) analysis of discrete dimensions of job quality; 2) analysis of patterns on job level; and 3) composite indices approaches. They are now discussed in turn.

3.2.1 Analyses of discrete dimensions of job quality

This basic approach is often used in research to analyse different dimensions of job quality separately, e.g. level of wages, job security etc. A typical example of this approach is the four country comparison based on the International Social Survey Programme data done by Olsen, Kalleberg, and Nesheim (2010) in which job security, the ability to work independently, the quality of physical working conditions, advancement opportunities etc. are analysed separately for the USA, West Germany, UK and Norway. Almost every other comparative study of job quality also partly follows this approach (e.g. Leschke and Watt, 2008; Muñoz de Bustillo and José Ignacio Antón, 2011) which complements the analysis of composite job quality indicators making them easier for interpretation. However, although this segmented analytical approach allows potential targeted policy intervention in specific job quality dimensions e.g. wages or job security, it ignores the combined effects of different aspects of jobs (low security highly skilled jobs) (Hauff and

Kirchner, 2014). Authors also point out the high degree of complexity in the case of a large number of dimensions, time periods and countries, which makes the linkage with theoretical explanations (e.g. employment regime and varieties of capitalism) extremely difficult.

3.2.2 Analysis of patterns on the job level

This approach acknowledges that combinations of job characteristics create “bad” and “good” jobs, following segmented labour market theories (e.g. Tilly, 1996, 1997) or general human resource management literature (David P. Lepak, Hui Liao, Yunhyung Chung, and Erika E. Harden, 2006).

The “bad” and “good jobs” are usually identified and classified by the use of cluster analysis. The most recent and extensive analysis using this approach was conducted by Holman (2013). Based on the European Working conditions survey from 2015, Holman first developed a taxonomy of six types of jobs (named and ranked in descending order in terms of job quality, measured in terms of job satisfaction and subjective well-being: active jobs, saturated jobs, team-based jobs, passive independent jobs, insecure jobs and finally high-strain jobs. Finally, Holman tested the institutional foundations of the distribution of high and low quality jobs in Europe using employment regime theories (Amable, 2003; Gallie, 2008). His analysis confirms employment regime theory, finding the highest proportion of higher-quality jobs in social-democratic regimes (Scandinavian countries), followed by continental regimes (e.g. Germany), then liberal employment regimes (UK, Ireland), and finally the highest proportion of low-quality jobs in southern European regimes (e.g. Spain, Italy). However the proportion of higher-quality jobs in the countries categorised as transitional employment regime countries (Poland, Czech Republic, Hungary) is not significantly different from the proportion in continental and liberal employment

regimes, however it was found that it is significantly higher than in Southern European employment regimes (Holman, 2013).

A critique of this analytical approach targets its high degree of abstraction and its limitations in analysing distinct dimensions of job quality (Hauff and Kirchner, 2014). This method reduces complexity, analysing job types and their distribution between countries with a method based on cluster analysis which is highly unlikely to replicate results in terms of the same job types on different data sets or using other sets of available variables (e.g. in graduate surveys or any national survey). The desired classifications of job types in terms of their quality should ideally aim to be as universal and empirically valid across different surveys as possible, rather than being contextually based.

3.2.3 The composite indices approach

This approach has been used in the majority of studies on cross-national differences in job quality which, with varying success, model and design a composite index of job quality which comprises different job dimensions. Unfortunately, as Hauff and Kirchner (2014) point out, in all the studies they analysed there is agreement neither about the dimensions to be used (see Table 1) nor about the weight of different dimensions (discussed in the next section). Hence different indices produce different results depending on the construction of the index (for illustration see the comparison of three indices based on EWCS 2005 data presented in Hauff and Kirchner 2014, which place the same countries in very different rank orders depending on the indices used). Despite these design challenges, indices represent from the methodological standpoint a rather elegant measure of job quality, because they allow countries to be compared and positioned unambiguously based on a single overall measure of job quality. Beside their suitability for analysis on a highly aggregated analytical level they can be also used to analyse country profiles

based on the index's sub-dimensions which can reveal heterogeneity within and between countries, as well within occupations and industry sectors (e.g. Muñoz de Bustillo and José Ignacio Antón, 2011). Creating one composite index of job quality implies a single, univocal and unidirectional understanding of what job quality is and leads inevitably to the ranking of countries, an approach often used due to its political attractiveness and its practical use in policy evaluation and design (Munoz de Bustillo et al., 2011).

However, the system of indicators (one index for each job quality dimension) creates more ambiguity and difficulties in interpretation, but avoids the trap of a badly constructed composite index which tends to radically simplify complex and multidimensional social reality. A practical way out of this dilemma is the parallel use and reporting of a composite job quality indicator with the system of indicators on which it is based (e.g. Leschke and Watt, 2008; Muñoz de Bustillo and José Ignacio Antón, 2011). In such way one can more clearly identify for instance differences in individual dimensions of job quality which might not as visible from the analysis of the composite index.

Having considered the advantages and disadvantages of these approaches, the author decided to pursue the last analytical approach and design a **Graduate Job Quality Index (GJQI)** which should not only allow a relatively clear cross-country comparison, but also the analysis of job quality distribution within countries e.g. between different sectors of economic activity as well as among individual graduates.

3.3 The problem of weighting different dimensions in the composite job quality index

Given this choice of analytical approach, which aims to create a composite index of graduate job quality, one comes to the main challenge of any multidimensional index, which is the process of assigning importance or weight to the individual dimensions of the construct being measured. Composite indicators, especially those linked with complex concepts like well-being, are widely used comparison instruments for policy and research purposes and the problem of the weighting of different dimensions has been addressed ever since the beginning of their use (Decancq and Lugo, 2013; Nardo et al., 2005). The fundamental philosophical question is whether to use normative criteria to set the weight and importance of particular dimensions, or to use data-driven factual criteria for establishing the weighting. Decancq and Lugo (2013) compare this choice to navigating the dangerous strait of Messina between the mythical Scylla and Charybdis. Normative approaches necessarily suffer from paternalism and the question of whose values we take as relevant in setting the importance of, for example, wages over skill utilisation in job quality index. On the other hand, data-driven weighting derives from the distribution of current values on different job dimensions and uses these weights to establish values for future jobs, or what “good” job quality or well-being should look like, which means that this approach also fails to escape Hume’s famous guillotine¹¹ (Decancq and Lugo, 2013).

The usual composite indicator, like job quality, can be expressed as in this model:

$$I(x) = w_1I_1(x_1) + \dots + w_mI_m(x_m) \quad (1)$$

¹¹ Hume's law, or Hume's guillotine is often referred to as is–ought problem, Hume found that there seems to be a significant difference between positive statements (about what is) and prescriptive or normative statements (about what ought to be), and that it is not obvious how one can coherently move from descriptive statements to prescriptive ones. This logical inconsistency problem appears, if for instance the current situation (is) in job quality dimensions is used to calculate weights for a normative job quality index (should) by means of e.g. principle component analysis this does mean that these weight and index should be applicable for any other future set of jobs.

In the model, index value $I(x)$, the value of index I for an individual of country x , is a sum of transformed¹² value of x in each of m number of dimensions ($I_1(x_1) \dots I_m(x_m)$) weighted with weights for each dimensions (w_1, \dots, w_m), which are assumed to be all non-negative and for simplicity all assumed to sum to one. This model of a composite index is frequently used due to its simplicity and clarity, but one has to be aware of its embedded assumptions. The model assumes infinite substitution between transformed values in each dimension. Dimensions are seen as perfect substitutes, which means that, for instance, an increase in wages can compensate on the basis of a one to one exchange for a deficit in work autonomy or skill utilisation.

Once this assumption is accepted, the problem of the method used for weighting becomes crucial. Overviews of practice in the creation of multidimensional indices of well being or general economic indices identified three distinct approaches when it comes to estimating weight: 1) Data-driven weighting; 2) Normative weighting; and 3) Hybrid weighting (Decancq and Lugo, 2013; Nardo et al., 2005). The following sections discuss their advantages and disadvantages in the potential application for the design of the graduate job quality index.

3.3.1 Data-driven weighting approaches

Data-driven approaches basically follow the maxim “let the data speak for themselves” and they either determine weight as: a) function of the distribution of values in each dimension (frequency-based approaches); or b) as a percentage of common variance explained by a particular dimension (principle component analysis based approaches); or c) as a function of the relative achievement of an individual with regard to different dimensions (the highest weight being attributed to the dimensions in which an individual performs best). Despite the seeming objectivity of data-driven approaches, there are also serious disadvantages. The first of these is that they are

¹² The usual transformations used in the design of indices are rescaling, linear transformation, increasing transformation e.g. logarithmic function etc.

very hard to interpret in the composite index and lack transparency, which limits their use for policy purposes. It is hard to imagine policy makers which would be able to explain in plain language how the relative importance of skill utilisation over wage levels derived from the factor analysis or other data-driven approaches. The second argument, especially against methods which use principle component analysis, is that lower weight is assigned to dimensions that are poorly correlated with others and to general underlying factors, while one could rightfully argue that a multidimensional approach in the design of an index is used precisely because important dimensions of a construct like job quality are not strongly correlated. Specific dimension like work autonomy might be very important for graduate work quality but if they are not correlated with other job quality dimensions like work life balance they would be assigned lower weights following for instance factor analysis method in determining weights. The latter argument is again derived from Hume's guillotine, and claims that normative tasks like weighing the importance of specific dimensions of job quality should not rely solely on mathematical algorithms (Decancq and Lugo, 2013).

The third of above mentioned methods (under c), based on relative achievement in particular dimensions so that each individual is allowed own their own weighting scheme, makes comparison between individuals extremely difficult. In addition it is extremely implausible to assume that dimensions in which an individual performs best overcompensate for their lack of achievement in other dimensions.

3.3.2 Normative weighting approaches

Normative approaches rely on judgement about the importance of individual dimensions. The ultimate example of such an approach is equal weighting which recognises all dimensions as equally important, or arbitrary weighting in which researchers and/or policy makers set the

importance of individual dimensions based on their system of beliefs (e.g. the Human Development Index). Another normative approach to the weighting of dimensions is to weight them based on expert opinion, where several experts or informed persons are consulted. The basic arguments against a normative approach when it comes to setting weights are paternalism and normatively set trade-offs between dimensions.

3.3.3 Hybrid weighting approaches

Hybrid approaches represent the newest group of approaches, which combine both data-driven and normative approaches. These use the value judgments of the individuals analysed e.g. graduate workers (rather than the judgements of the researchers or policy makers) together with data and the distribution of actual values in particular index dimensions.

The first subgroup of these approaches is 'stated preference weighting', in which weights are based on the stated importance that individuals or groups attributed to each observed dimension. This approach, based on stated preferences, has a long tradition in sociological literature on poverty and perceived necessities (Decancq and Lugo, 2013). In studies of job quality it can be utilised if workers are asked about the importance (to them) of different dimensions of job quality. This can be done by asking them to rank each dimension, or to indicate their importance on a Likert scale (using one scale for each dimension). These types of variables are very rare in the available social surveys on job quality, although they are present in some graduate surveys used in Europe (e.g. REFLEX and HEGESCO surveys). They might be a sensible option for the design of the graduate job quality index. Alternatively, researchers conduct a separate special survey just for the purpose of establishing weights for different analytical dimensions of job quality. This was the approach in the only so far available indexing attempt for graduate job quality (Boccuzzo and Gianecchini, 2014). The stated preference weightings do avoid Hume's guillotine by asking same

people about facts, as well as about values and norms about these facts, however some authors call this approach “too subjective” (Schokkaert, Van Ootegem, and Verhofstadt, 2009) as it takes into account individual preferences which tend to change; they may also differ between countries and within different subgroups of workers, making comparative judgements difficult if not impossible..

The second subgroup of hybrid approaches is the hedonic approach proposed by Schokkaert (2007) for the creation of wellbeing indices in which weights attributed to the different elements/dimensions are derived from regression of different variables (functionings) representing dimensions of wellbeing in self-reported life satisfaction. Schokkaert suggests that “it does not seem unreasonable to give a larger weight in the social evaluation to functionings that have a larger effect on life satisfaction. And it is perhaps not very reasonable for society (or for the policy-makers) to give priority to increasing the level of functionings that seem to be largely irrelevant for life satisfaction — or might even have a negative effect” (Schokkaert, 2007. p.423). A similar analogy can be made about the relationship between job satisfaction and different elements that objectively contribute to the graduates' feelings of job satisfaction. The hedonic weighing approach proposed by Schokkaert (2007) uses regression of life satisfaction (or in the case of this research, job satisfaction) on a set of variables representing different dimensions of well being (which could be applied to dimensions of job quality) in which weights are obtained from the estimated β coefficients as expressed in the following model (a similar approach mentioned by Nardo et al., 2005) as *unobserved components weighing* model):

$$Y^i = \alpha + \beta_1 I_1(x^i_1) + \dots + \beta_m I_m(x^i_m) + \varepsilon^i \quad (2)$$

In the model, Y represents job satisfaction for each individual i and $I(x^i)$ represents a individual achievement of individual i on all of m number of job quality dimensions. The error term ε^i captures all idiosyncratic individual factors that may influence the objective effect valuation of job

satisfaction (values, aspirations, low expectations etc). Based on model (2), illustrated above, the index of job quality, which is similar to model (1) (illustrated above, on page 72) and assumes an absolute degree of substitutability of different dimensions, is:

$$I(x) = \beta_1 I_1(x_1) + \dots + \beta_m I_m(x_m) \quad (3)$$

The positive features of this weighting approach come from the possibility of making the regression model more sophisticated (see for example Decancq and Lugo, 2013). One can make it multilevel and control for country level variance in job satisfaction, influenced for example by cultural norms; or one might include additional explanatory variables as controls such as demographic variables (for example, gender); or additional explanatory variables such as the level of expectation fulfilment (which is largely attributed to the level of job satisfaction as outlined in a previous section). The challenges to this model and weighting approach are associated with the assumptions of any regression model. The error term is assumed to be independent across all indicators (homoscedasticity) and that dimension should ideally measure a particular aspect of the phenomenon like job quality and not be highly correlated. Lastly, but not least important, is a (normative) decision about which variables to treat as dimensions of job quality and which as exogenous control variables ((Decancq and Lugo, 2013).

Based on the overview of weighting approaches, the hedonic weighting approach elaborated last has been chosen for the development of the graduate job quality index created in this research. Reasons for choosing this weighting approach include those that conceptually link job satisfaction and individual dimensions of job quality, as Schokkaert (2007) has described (see the above quote). This approach also avoids the downsides associated with normative and purely data-driven weighting approaches discussed in this section. Finally, the flexibility of the method was important, based on regression modelling that allowed for the control of multiple other factors

associated with job satisfaction. The most important of these were probably expectations and values. Controlling for the fulfilment of job expectations was possible due to the unique battery of questions on this issue available in the REFLEX and HEGESCO questionnaires.

3.4 Graduate job quality index (GJQI): Data and method

3.4.1 The Survey

The creation of the Graduate Job Quality Index (GJQI) and subsequent analysis of distribution of GJQI and its dimensions across sectors of economy (Chapter 4) was based on the combined data from REFLEX¹³ and HEGESCO¹⁴ graduate surveys. Both surveys used the same instrument and in each country a representative sample included tertiary education graduates of who received their degrees five years before the survey. The REFLEX survey was carried out in 2005 in 15 countries (Austria, Belgium-Flanders, the Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden and the UK) on graduates who completed their degrees in the academic year 1999/2000. The HEGESCO Project was carried out two to three years later (2007 or 2008, depending on the country) in 5 additional countries (Slovenia, Turkey, Lithuania, Poland and Hungary) on graduates who completed their degrees in the academic year 2002/2003. The survey covered graduates from ISCED5A study programmes of the first or second study cycle¹⁵ (ISCED5A are generally seen as academically oriented, as opposed to ISCED5B, which are more vocationally oriented programmes). Together, the surveys reached more than 145,000 graduates and had an overall response rate of 31%. The mail questionnaire focused on educational experiences before and during higher education, the

¹³ A detailed description of the REFLEX project is available at <http://www.fdewb.unimaas.nl/roa/reflex/> or in the overview report (Allen & Van der Velden, 2011)

¹⁴ A detailed description of the HEGESCO project is available at <http://www.hegesco.org/index.php> or in the project report (Allen & Van der Velden, 2009)

¹⁵ Cycles refer to study level. First cycle programmes were defined as those without direct access to PhD studies (bachelor's degrees), while second level programmes were those *with* access (master's programmes.)

transition to the labour market, characteristics of the first job, characteristics of the occupational and labour market career up to the present, characteristics of the current job, characteristics of the current work organization, assessment of required and acquired skills, evaluation of the educational program, work orientations, and some socio-biographical information.

For the purposes of this analysis, data from Sweden were excluded, since its survey design largely deviates from other countries (Verhaest & Van der Velden, 2013) as were the data from Turkey and Japan, due to the linkage with data from the EU Labour force survey data, which was used, for example, to calculate some of the explanatory variables applied in the later analysis (e.g. the level of educational attainment in different sectors of the economy). The final number of countries left in the dataset was 17. Finally, the graduate survey was used as a proxy survey of the job quality of graduate workers in relevant economies, although this was not its original purpose. The survey used stratified random sampling, based on which higher education institutions graduates attended. Transformation into a proxy sample of young graduate workers was achieved by assigning weights to individual graduate workers covered by the REFLEX and HEGESCO surveys, based on 1) graduates' country of employment, sector of employment and occupation, and 2) the distribution of graduate workers in different sectors and occupations within the EU labour force of the relevant age cohort (25-34) calculated on the basis of EU Labour Force Survey data extractions (described in detailed in the next chapter).

Only graduates who were employed or self-employed at the time of the survey and were working in one of the 17 selected countries were selected (regardless of which country they completed their degree). Taking into account all these reductions, the final sample contained 32445 graduate workers in 17 European countries. All basic analyses were performed using IBM SPSS[®]22 while multilevel modelling was performed with the use of MLwiN 2.34[®] software

packages. The **Table 2** below shows the personal characteristics of the employed graduates 5 years after graduation:

Table 2: Characteristics of employed graduates 5 years after graduation (n=32445)

Personal characteristics	%
Gender	
Male	40.4
Female	59.6
Age	
≤ 26	3.4
27	10.0
28	15.5
29	17.5
30	13.7
31	10.2
32	7.0
33	4.9
≥ 34	17.8
Academic background	
ISCED5A* programmes providing direct access to doctorate	55.2
ISCED5A* programmes not providing direct access to doctorate	44.8
Disciplinary field	
Education	11.9
Humanities and Arts	9.7
Social sciences, Business and Law	32.9
Science, Mathematics and Computing	9.2
Engineering, Manufacturing and Construction	17.1
Agriculture and Veterinary	2.9
Health and Welfare	13.3
Services	3.1
Job characteristics	%
Sector	
Public sector	42.9
Private non-profit sector	6.5
Private profit sector	48.8
Other	1.7
Branch of industry	
A - Agriculture, hunting and forestry	1.0
B - Fishing	0.1
C - Mining and quarrying	0.7
D - Manufacturing	12.2

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E - Electricity, gas and water supply	0.9
F - Construction	3.3
G - Wholesale and retail trade; repair of motor vehicles and other goods	4.7
H - Hotels and restaurants	0.7
I - Transport, storage and communications	3.8
J - Financial intermediation	5.2
K - Real estate, renting and business activities	17.6
L - Public administration and defence; compulsory social security	9.4
M - Education	20.4
N - Health and social work	15.1
O - Other community, social and personal service activities	
Size of company/organisation	
1-9	12.8
10-49	17.9
50-99	10.9
100-249	11.8
250-999	15.2
1000 or more	31.5

* International standard classification of qualifications level 5A

3.4.2 GJQI structure, job quality dimensions and variables and model

The GJQI is a composite indicator and the concept of graduate job quality, as discussed in the previous sections, was constructed from several dimensions based on the theoretical overview and on research findings that showed the effect of these factors on the satisfaction of workers in general as well as on their well-being. The GJQI was conceptualised as a combination of five job quality dimensions: income, skill utilisation, work autonomy, work life balance and job security. Each of these aspects of job quality consists of one or more variables which reflect their dimensions as theoretical constructs. Multi-item dimensions such as *work autonomy* and *work life balance* were developed using factor analysis (see Table 3 below).

Following the model of composite indicators presented previously (1), the GJQI has the following structure for an individual i and is a weighted mean of the five aforementioned job quality dimensions:

$$\text{GJQI} = w_{\text{income}}\text{Income}_i + w_{\text{skill}}\text{SkillUtil}_i + w_{\text{autonomy}}\text{Autonomy}_i + w_{\text{security}}\text{Security}_i + w_{\text{worklife}}\text{WLB}_i$$

This model of the composite indicators assumes that high values in some dimensions can compensate for low values in others, in accordance with the argument of the compensating differentials approach in the labour market research (Boccuzzo and Gianecchini, 2014; Munoz de Bustillo et al., 2011).

Table 3: Dimensions and used variables for composing the GJQI

Dimension	Question	Computation and values	Factor loading if applicable
Work autonomy*	To what extent are you responsible for setting goals for your own work?	1-5, not at all - to a very high extent	0.452
	To what extent are your responsible for deciding how you do your own job?	1-5, not at all - to a very high extent	0.698
	To what extent do the following job characteristics apply to your current work situation? Work autonomy	1-5, not at all - to a very high extent	0.793
Hourly wage PPP**	What are your gross monthly earnings?	Monthly gross salary x PPP coefficient?/monthly working hours	n.a.
Skill	To what extent are your knowledge and skills utilised in your current work?	1-5, not at all - to a very high extent	n.a.
Job security	To what extent do the following job characteristics apply to your current work situation? Job security	1-5, not at all - to a very high extent	n.a.
Work-life balance/Flexibility***	To what extent do the following job characteristics apply to your current work situation? Good chance to combine work with family tasks	1-5, not at all - to a very high extent	0.772
	To what extent do the following job characteristics apply to your current work situation? Enough time for leisure activities	1-5, not at all - to a very high extent	0.772

* KMO=0,622, Cronbach's alpha= 0.675, principle axis factor (PAF)

**Values of the 3rd and 97th percentile have been assigned to 3rd and 97th percentile, respectively

***KMO=0,5, Cronbach's alpha=0,748, principle axis factor (PAF)

All indicators have been rescaled between 0 and 1 by subtracting the minimum and then dividing by range

3.4.3 The Weighting procedure

For the purposes of weighting different job quality dimensions, a hybrid approach classified as the hedonic weighting approach was chosen (Decancq and Lugo, 2013; Schokkaert, 2007). In order to establish the weight of different job quality dimensions the following linear regression model (**MODEL 1**) was proposed:

$$\text{Job Satisfaction}_i = \alpha + \beta_1 \text{Income}_i + \beta_2 \text{SkillUtil}_i + \beta_3 \text{Autonomy}_i + \beta_4 \text{Security}_i + \beta_5 \text{WLB}_i + \varepsilon_i$$

The dependent variable is the level of job satisfaction. Respondents were asked how satisfied they were with their current job on a 5-point Likert scale (1-very dissatisfied, 5-very satisfied). Following the usual practice in research based on social surveys using Likert scales the dependent variable was treated and used in the model as continuous.

In order to refine the model and control for other factors that contribute to job satisfaction several other control variables were introduced into the single level linear regression model. Significant control variables used in previous research on job satisfaction are gender, age and education level (e.g. Hauff et al., 2015, Locke, 1970). However, controlling for age and education level in a sample of higher education graduates of the same graduate cohort did not make sense, so only the dummy variable for gender was included in the model. Lastly, several other explanatory variables could be used, thanks to the specific nature of the REFLEX and HEGESCO surveys. As outlined in a previous section, one of the major theoretical and empirical explanations for the level of job satisfaction (Locke, 1969, 1970) sees it as an affect which is based on a subjective evaluation of the existing discrepancy between what workers want from their job and what they perceive they get from it. In other words, job satisfaction is a function of the fulfilment of expectations of the job. The REFLEX and HEGESCO surveys asked graduates to indicate on a Likert scale (1= not at all, 5= to a very high extent):

1. How important the following job characteristics were to them personally (expectations and aspirations), and
2. To what extent they actually applied to their current job situation (perceived job reality).

The job characteristics under evaluation were the following: work autonomy, job security, opportunity to learn new things, high earnings, new challenges, good career prospects, enough time for leisure activities, social status, chance of doing something useful for society, and good chance to combine work with family tasks.

Subtracting values concerning perceived job characteristics of their actual jobs from the values of importance of the same job characteristics for respondents, a synthetic variable named aspiration-fulfilment was created for each job characteristic. The calculated aspiration-fulfilment variables are on the scale between -4 and 4 in which 0 represents a perfect match between expectations and reality, negative values (-1 to -4) represent either a deficit of expectations or the extent to which real job characteristic give more than aspired/expected. Positive values (1 to 4), on the other hand, indicate either a surplus of aspirations or that respondents perceived job characteristics are less than they would like. After performing factor analysis on the aspiration-fulfilment variables, 3 factors were identified¹⁶:

1. Career and status gap (high earnings, good career prospects, social status)
2. Professional challenge gap (new challenges, opportunity to learn new things, social status)
3. Work life balance gap (enough time for leisure activities, good chance to combine work with family tasks)

¹⁶ Variables concerning aspiration fulfilment in terms of job autonomy, job security and job meaningfulness (chance of doing something useful for society) were removed from initial factor analysis due to very low factor loadings.

Introducing these control variables into the single level regression we achieved the following model (**MODEL 2**):

$$\text{JobSatisfaction}_i = \alpha + \beta_1 \text{Income}_i + \beta_2 \text{SkillUtil}_i + \beta_3 \text{Autonomy}_i + \beta_4 \text{Security}_i + \beta_5 \text{WLB}_i + \beta_6 \text{Female}_i + \beta_7 \text{ProfChallGap}_i + \beta_8 \text{CareerStatusGap}_i + \beta_9 \text{WorkLifeBalanceGap}_i + \varepsilon_i$$

Finally, in order to control for potential cross-cultural differences, the ordinary linear regression model outlined was transformed into a 2-level multilevel random intercept regression model where the job satisfaction variable was allowed to be random at the country level (**MODEL 3**).

The results section presents the regression estimates for all three models in comparison and calculates weightings based on β coefficients of job quality dimensions. They should reflect the extent to which different dimensions of job quality objectively contribute to the level of job satisfaction, once fluctuating individual aspirations and values relating to job and work are taken into account and controlled for, as well as gender and potential country specifics.

3.4.4 Validation of the GJQI

The GJQI was validated in two ways for its content validity. Based on the existing literature it can be assumed that job quality is correlated with higher levels of job satisfaction as well as that poor job quality is one of the major reasons for absenteeism as well as employee turnover. The survey asked graduates about their intentions to leave the current job:

Have you actively tried to obtain (other) paid work in the past 4 weeks?

Possible answers: Yes, No, No, but I am awaiting the results of an earlier job application

The responses were recoded into a binary variable for indicating an active search for another job (answers “Yes” and “No, but I am awaiting the results of earlier job application”

or no active alternative job search (answer “No”). Logistic regression was performed on this dichotomous variable, using as explanatory variables the scores for all 5 dimensions (skill utilisation, work autonomy, income, job security and work life balance) as well as for the GJQI. Secondly, content validity was checked by cross-tabulation of the GJQI with occupational categories as defined in the International Standard Classification of Occupations. Some previous studies confirmed that higher occupational categories (managers and professionals) are associated with higher job quality than lower job categories (associate professionals, technicians etc.) (Holman, 2013).

3.5 Graduate job quality index (GJQI): Results

3.5.1 The GJQI dimensions

Descriptive analysis of the means for each of the chosen dimensions of job quality (**Table 4**) showed that in the overall sample of graduates work autonomy had the highest mean score (mean=0.7870)¹⁷. In that dimension graduates in the Lithuanian sample had the highest score (mean=0.8730) while graduates in Hungary had the lowest (mean=0.6968). Skill utilisation had the second highest overall score (mean=0.7384) and in that dimension Portugal had the highest score (mean=0.8479) while Spain (mean=0.7023) and France (mean=0.7025) had the lowest scores. The job security dimension was in third place overall (mean=0.6929) and in that dimension Estonia had the highest score (mean=0.7969) while graduates from Germany had the least secure jobs (mean=0.6312). The fourth highest score overall belonged to the work life balance/flexibility dimension (mean=0.5784), in which Lithuania had the highest score (mean=0.6381) and Portugal the lowest (mean=0.5130). The gross income dimension had the lowest score overall (mean=0.1965 or 11.89 PPP Euros per hour). Mean graduate gross income was highest in Germany (mean=0.2962 or 17.89 PPP Euros per hour) and lowest in Hungary (mean=0.1115 or 6.75 PPP Euros per hour). The country ranks represent the means for non-weighted country data and they were used only for preliminary description of the sample. Further analytical sections use data weighted for the overall proportion of highly educated labour or particular age groups in different occupations and sectors of industry in each country.

¹⁷ All variables have been rescaled on the scale 0 to 1.

Table 4: Dimensions of GJQI and the mean values for all countries in the sample

Country of employment		Income rescaled	Autonomy rescaled	Skill Utilisation rescaled	Job Security rescaled	Work Balance rescaled	Life	Hourly Wage PPP
Austria	Mean	0.2388	0.8393	0.7572	0.6628	0.5737		14,4572
	Std. Deviation	0.07937	0.19101	0.23966	0.30467	0.27080		4,80528
Belgium	Mean	0.2545	0.8179	0.7265	0.6560	0.5866		15,4085
	Std. Deviation	0.06837	0.17707	0.23435	0.30607	0.26336		4,13899
Czech Republic	Mean	0.1337	0.8111	0.7355	0.7388	0.5588		8,0964
	Std. Deviation	0.04966	0.18761	0.25172	0.24754	0.26838		3,00627
Estonia	Mean	0.1380	0.8241	0.7833	0.7969	0.5782		8,3549
	Std. Deviation	0.05676	0.17596	0.24563	0.23262	0.25736		3,43630
Finland	Mean	0.2272	0.8160	0.7769	0.6623	0.6304		13,7528
	Std. Deviation	0.06739	0.18054	0.22569	0.31885	0.23814		4,07961
France	Mean	0.2234	0.7330	0.7023	0.6498	0.6099		13,5243
	Std. Deviation	0.09815	0.22949	0.26386	0.36770	0.29247		5,94174
Germany	Mean	0.2962	0.8475	0.7396	0.6312	0.5166		17,9330
	Std. Deviation	0.10018	0.17964	0.23677	0.33129	0.27036		6,06459
Hungary	Mean	0.1115	0.6968	0.7405	0.6871	0.5221		6,7516
	Std. Deviation	0.05841	0.25382	0.28009	0.25983	0.26114		3,53635
Italy	Mean	0.1660	0.7218	0.7353	0.6391	0.5670		10,0494
	Std. Deviation	0.07059	0.22991	0.26860	0.33977	0.26114		4,27329
Lithuania	Mean	0.1211	0.8730	0.7028	0.7190	0.6381		7,3296
	Std. Deviation	0.07742	0.16527	0.26558	0.29921	0.27423		4,68697
Netherlands	Mean	0.2434	0.8019	0.7168	0.6752	0.6272		14,7364
	Std. Deviation	0.06254	0.16533	0.23266	0.28068	0.22869		3,78646
Norway	Mean	0.2776	0.7864	0.8046	0.7318	0.6302		16,8077
	Std. Deviation	0.09033	0.19296	0.21870	0.28083	0.23370		5,46873
Poland	Mean	0.1391	0.7471	0.7162	0.7507	0.5887		8,4235
	Std. Deviation	0.06666	0.23621	0.28111	0.26003	0.25793		4,03541
Portugal	Mean	0.1894	0.8239	0.8479	0.6413	0.5130		11,4669
	Std. Deviation	0.07747	0.17497	0.20058	0.32048	0.26919		4,68983
Slovenia	Mean	0.2048	0.7746	0.7468	0.7216	0.5554		12,3963
	Std. Deviation	0.08411	0.20994	0.26010	0.28482	0.26553		5,09173
Spain	Mean	0.1673	0.7413	0.7025	0.6708	0.5803		10,1280
	Std. Deviation	0.06544	0.23073	0.28832	0.31977	0.28725		3,96174
United Kingdom	Mean	0.2481	0.7581	0.7058	0.7002	0.5189		15,0218
	Std. Deviation	0.09397	0.21157	0.28424	0.29046	0.26808		5,68915
Total	Mean	0.1965	0.7870	0.7384	0.6929	0.5784		11,8980
	Std. Deviation	0.09055	0.20490	0.25580	0.29805	0.26506		5,48173

3.5.2 Weights

When job satisfaction was estimated with the 5 chosen job quality dimensions as predictors (Model 1) it was found that all five dimensions were significant predictors ($p < 0.05$) (results presented in the **Table 5**, below). Skill utilisation was by far the best predictor ($\beta = 0.322$), followed by work autonomy ($\beta = 0.228$), income ($\beta = 0.185$), work life balance ($\beta = 0.093$) with job security in last place ($\beta = 0.092$). The overall model fit was $R^2=0.229$. Once the aspiration-reality gap variables were included in the model (Model 2) the overall model fit was substantially increased ($R^2=0.341$). All aspiration-reality gap variables were statistically significant ($p < 0.05$) and negative predictors of job satisfaction. Non-fulfilment of professional aspirations ($\beta = -0.430$) as well as career status and income aspirations ($\beta = -0.417$) were the overall best predictors of job satisfaction, which strongly supports Locke's affect or discrepancy theory of job satisfaction. The aspiration-reality gap in terms of work life balance is a far less important but still significant predictor ($\beta = -0.049$). The inclusion of the aspirations-reality gap predictors decreases the predictive value of job characteristics (job quality dimensions), especially for the income dimension, but they still remain significant. Gender as a control variable is also statistically significant, yet not so strong a predictor of job satisfaction ($\beta= 0.015$, $p < 0.05$) confirming the findings of many other studies that women tend to be more satisfied with their jobs than men. A random intercept (multilevel) model (Model 3), which was developed to test if there is potentially significant variance in job satisfaction between countries due to cultural differences in values which would justify using that model over the ordinary regression model (Model 3), showed that such random intercept model does not have a better fit than a single level regression model (based on chi square distribution for one degree of freedom). This indicates that between-country differences in job satisfaction are not significant once all dimensions (job quality, aspiration-reality gaps and gender) are

controlled for. Initial very small between-country variance can be therefore interpreted as an effect of differences in different aspiration-reality gaps at the individual level in different countries as well as of different gender structures in graduate samples.

The beta scores of the five job quality dimensions from Model 2 were therefore assumed to reflect the extent to which different dimensions of job quality contribute to the level of job satisfaction. This was after fluctuating individual aspirations and values about jobs and work were taken into account and controlled for, as well as gender differences.

Finally, using beta scores and the model for calculation of the overall composite index (3) the following weights were calculated:

Skill utilisation 0.4065 or 40.65%

Work autonomy 0.2419 or 24.19%

Income 0.1491 or 14.91%

Work life balance 0.1139 or 11.39%

Job security 0.0886 or 8.86%

Not surprisingly, the professional relevance of jobs as well as work autonomy were the most important job quality dimensions for evaluating the overall quality of graduate jobs. Income was far less important especially when the aspiration-reality gap concerning career status and income was controlled for. The relative dominance of so-called professional over economic dimensions of graduate jobs was also found (Boccuzzo and Gianecchini, 2014) based on different weighting methods and an Italian university sample of graduates.

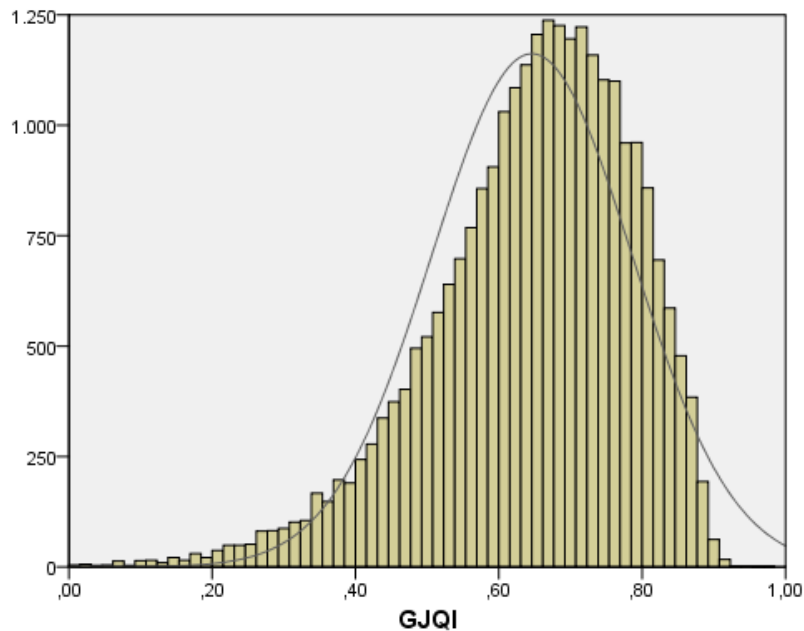
Table 5: Results of the regression models used for establishing weights of different job quality dimension in the GJQI

	Model 1	S.E.	Model 2	S.E.	Model 3	S.E.
Response	Job Satisfaction		Job Satisfaction		Job Satisfaction	
Fixed Part						
cons	0.124	0.007	0.712	0.019	0.719	0.020
Income	0.185	0.015	0.106	0.017	0.161	0.019
Skill Utilisation	0.322	0.006	0.289	0.006	0.291	0.006
Autonomy	0.228	0.007	0.172	0.007	0.173	0.007
Work Life Balance	0.093	0.005	0.081	0.008	0.076	0.008
Security	0.092	0.005	0.063	0.005	0.061	0.005
Professional Challenge Gap			-0.430	0.013	-0.438	0.013
Career Status Gap			-0.417	0.014	-0.419	0.014
Work Life Balance Gap			-0.049	0.016	-0.065	0.017
Female			0.015	0.003	0.017	0.003
Random Part						
Level: country						
cons/cons					0.0006	0.0002
Level: individual						
cons/cons	0.048	0.000	0.043	0.000	0.0423	0.0004
Adjusted R square	0.229	0.219	0.341	0.206		
-2*loglikelihood:	-5.271.389		-6.505.153		-6.699.953	
Units: country	17		17		17	
Units: indiv	26417		26417		26417	

3.5.3 The GJQI: distribution

The distribution of the GJQI is presented in Figure 10 and the indicator ranges between 0 and 0.97 covering almost the entire interval 0 to 1. The distribution is smooth and slightly skewed towards the lower values with a mean of 0.646 (standard deviation = 0.14) and a median of 0.664. Relatively high mean and median values are due to the fact that skill utilisation and work autonomy have very high scores and carry the highest weight in the index.

Figure 10: GJQI distribution



3.5.4 Descriptive analysis of GJQI and its content validity

Descriptive analysis of the JQCI and its dimensions (**Table 6** and **Table 7** below) shows the distribution of job quality according to personal and job characteristics of graduate workers.

There are overall very small differences between genders in job quality, however statistical significance is probably there because of the large sample size. Female graduates have higher scores in all job quality dimensions apart from income. The differences are probably a reflexion of the different gender structure of the labour force in different sectors of industry.

The GJQI increases with age ($p < 0.0001$), primarily because of the contribution of the skill utilisation and income dimensions. However, although it remains statistically significant, the overall size of the effect of age on job quality is small. Differences between different levels of study programme (bachelor vs masters' programmes) are barely significant in the overall sample ($p = 0.049$) with job security and skill utilisation being the only dimensions in which

there is some, yet very small, difference (masters' graduates showing more skill utilisation and having less job security). Differences between graduates of different fields of study are statistically significant ($p < 0.0001$) with students from education and medical studies having by far better job quality than graduates from other fields, which is due to the exceptionally high levels of job security, skill utilisation, work autonomy, and (in the case of education graduates) a better work life balance. All these high scores offset the lower incomes of education graduates in comparison with graduates of other fields of study. Graduates of education studies and teacher training have the highest scores in the area of work autonomy, job security and work life balance. Graduates of health and welfare study fields have the highest scores in terms of skill utilisation, while graduates of computer science, mathematics and science have higher scores on average in terms of income dimension.

Differences in terms of industry sector confirm previous findings based on disciplinary background, showing statistically significant differences between different sectors of employment. Graduate jobs in primary, secondary and higher education, as well as social work, show the highest overall scores in job quality, especially in terms of work autonomy and work life balance. The lowest mean job quality can be found in the group of graduate jobs in the field of retail and wholesale and in the field of transport and communications. Skill utilisation is highest among graduates working in the fields of health, primary and secondary education, higher education, and research and development. Work autonomy has the highest scores among graduates working in all levels of education, research and development, social work and media as well in the area of real estate, advertising and other business activities. Income is highest among graduates working in the computer services sector, financial and health sectors. Work life balance has the highest scores among graduates working in the education sector, social work and public administration. Job security is also highest in these sectors, with the exception

of graduates working in higher education who report a lower level of job security than almost all other groups.

Differences in job quality between organisations and firms of different size are statistically significant yet with a small effect size. Job quality in smaller firms and organisation is higher due to the contribution of the skill utilisation and work autonomy dimension scores, which decrease as organisations/firms increase in size. On the other hand, graduate workers in larger organisations and companies experience higher level of income as well as higher job security.

Finally, the difference in the GJQ between the private and public sector is small (0.621 vs. 0.672), yet statistically significant because of the large size of the sample and because of the aforementioned big differences between industry sectors.

Lastly, the content validity of the GJQI was checked by logistic regression analysis which predicted the likelihood of workers searching for another paid job while in their current employment, using GJQI as the predictor. The GJQI is a significant explanatory variable in the model ($p < 0.001$), for which the relative risk of “not being applying for other jobs” is estimated at 32.73 (95 % CI 26.21–40.89): that is, the chance of workers not applying for alternative paid jobs increases by 327.3 % as the index value shifts from 0 to 1. A more reasonable increase in GJQI, such as 0.2, suggests a relative risk of 2.002 (1.910–2.100); that is, the chance of a worker not applying for other jobs would double (increase 100 %) as GJQI increases by 0.2 points. These findings confirm the content validity of GQJI as a good predictor of job commitment.

Table 6: GJQI and its dimensions and personal characteristics of graduates

Personal characteristics	Mean	SD	p	Eta squared	Skill Utilisation	Work Autonomy	Income	Work Life Balance	Security
Gender			0.000	0.001					
Male	0.640	0.137			0.733	0.783	0.211	0.554	0.680
Female	0.650	0.142			0.743	0.790	0.186	0.595	0.702
Age			0.000	0.009					
≤ 26	0.610	0.142			0.720	0.759	0.187	0.587	0.703
27	0.635	0.139			0.715	0.779	0.177	0.588	0.700
28	0.639	0.137			0.727	0.784	0.177	0.582	0.698
29	0.643	0.137			0.738	0.784	0.181	0.578	0.701
30	0.644	0.140			0.738	0.778	0.194	0.580	0.687
31	0.645	0.141			0.742	0.781	0.202	0.581	0.685
32	0.645	0.144			0.738	0.784	0.216	0.560	0.686
33	0.651	0.138			0.747	0.794	0.226	0.581	0.666
≥ 34	0.658	0.138			0.764	0.794	0.224	0.571	0.660
Academic background			0.049	0.000					
ISCED5A programme providing direct access to doctorate*	0.648	0.137			0.744	0.794	0.196	0.573	0.682
ISCED5A programmes not providing direct access to doctorate*	0.644	0.143			0.731	0.779	0.197	0.586	0.707
Disciplinary field			0.000	0.022					
Education	0.685	0.139			0.782	0.832	0.179	0.630	0.733
Humanities and Arts	0.639	0.153			0.719	0.796	0.195	0.596	0.657
Social sciences, Business and Law	0.635	0.141			0.716	0.782	0.201	0.575	0.694
Science, Mathematics and Computing	0.631	0.144			0.715	0.780	0.208	0.577	0.636
Engineering, Manufacturing and Construction	0.634	0.131			0.718	0.786	0.204	0.545	0.687
Agriculture and Veterinary	0.626	0.141			0.710	0.779	0.159	0.576	0.679
Health and Welfare	0.678	0.124			0.826	0.765	0.197	0.566	0.721
Services	0.632	0.145			0.696	0.773	0.191	0.606	0.732

Table 7: GJQI and its dimensions and job characteristics of graduates

Job characteristics	Mean	SD	p	Eta squared	Skill Utilisation	Work Autonomy	Income	Work Life Balance	Security
Sector			0.000	0.032					
Public sector	0.672	0.130			0.779	0.790	0.194	0.629	0.716
Private non-profit sector	0.661	0.136			0.756	0.821	0.199	0.609	0.662
Private profit sector	0.621	0.144			0.702	0.779	0.200	0.530	0.679
Other	0.637	0.142			0.725	0.809	0.175	0.582	0.666
Branch of industry			0.000	0.068					
Manufacturing	0.619	0.137			0.683	0.786	0.211	0.536	0.686
Construction	0.624	0.132			0.715	0.789	0.177	0.485	0.683
Wholesale and retail trade	0.586	0.161			0.611	0.774	0.184	0.540	0.708
Transport and communications	0.594	0.156			0.651	0.740	0.208	0.574	0.667
Financial intermediation	0.607	0.142			0.677	0.735	0.218	0.556	0.714
Computer related services	0.627	0.140			0.700	0.760	0.252	0.559	0.678
Research and development	0.667	0.123			0.798	0.806	0.202	0.596	0.555
Legal, accounting, bookkeeping, auditing activities	0.650	0.131			0.772	0.794	0.224	0.521	0.652
Architectural, engineering and other technical activities	0.647	0.130			0.785	0.772	0.200	0.531	0.641
Real estate, advertising and other business activities	0.625	0.146			0.688	0.804	0.207	0.563	0.662
Public administration and defence	0.632	0.139			0.700	0.738	0.182	0.657	0.763
Primary and secondary education	0.704	0.117			0.801	0.847	0.204	0.660	0.754
Higher education	0.699	0.110			0.848	0.852	0.192	0.610	0.530
Other education	0.674	0.135			0.772	0.833	0.171	0.621	0.681
Health	0.679	0.127			0.831	0.759	0.219	0.561	0.717
Social work	0.683	0.130			0.778	0.817	0.206	0.636	0.715
Media, culture, recreation, membership organisations activities	0.644	0.141			0.731	0.806	0.174	0.583	0.650
Size of company/organisation			0.000	0.003					
1-9	0.656	0.142			0.763	0.836	0.168	0.566	0.635
10-49	0.654	0.139			0.747	0.806	0.178	0.586	0.698
50-99	0.657	0.135			0.751	0.800	0.184	0.587	0.712
100-249	0.644	0.140			0.735	0.779	0.193	0.578	0.702
250-999	0.639	0.140			0.725	0.772	0.198	0.571	0.702
1000 or more	0.638	0.139			0.725	0.761	0.220	0.574	0.703

4 Graduate job quality in the social context

4.1 The research gaps in explaining the variance of graduate job quality – institutions, global trends and mysterious unobserved skills

The variety in overall levels of job quality and stratification patterns in labour markets have been traditionally in the comparative research seen as a reflex of the different macro institutional regimes which are conceptualised either as different varieties of capitalism (Hall and Soskice, 2001; Iseke and Schneider, 2012), welfare regimes (Esping-Andersen, 2013) or distinct employment regimes (Gallie, 2008). Regime theories are by nature static, see institutional regimes as relatively stable and neglect the forces of change which influence job quality. For the purposes of this research the varieties of capitalisms perspective (Hall and Soskice, 2001) is considered most relevant as it emphasises the importance of labour market regulation and educational system characteristics. The varieties of capitalism analytical perspective, for example, sees differences in job quality as reflexes of differences in industrial relations and labour market regulation (more coordinated, regulated and unionised systems vs more market driven liberal systems) and on educational systems (vocational vs more general oriented education systems). Coordinated market economies with strong labour market regulation and vocationally oriented education systems are seen to provide, in general, a better quality of jobs in a variety of aspects (Gallie, 2008) than liberal systems. Nevertheless, despite the evidence that a national system of labour market regulation does to some extent influence the overall quality of jobs in a specific country, there are also other global social and economic trends that might contribute to deterioration or improvement in job quality irrespective of institutional regimes.

Dynamism in job quality changes, especially trends towards polarisation and overall deterioration in work conditions and rewards is almost always explained by global trends, which function irrespective of national macro regimes (Brown, Lauder, and Ashton, 2012) .

Increases in inequalities in earnings, job security, work autonomy and other attributes of job quality in most labour markets has been traditionally attributed to two main factors:

1) increased competition and work outsourcing activities due to **globalisation** which changes the nature of work not only in the case of low-skilled workers but also increasingly in the area of professional and high-skill work (Brown et al., 2012)

2) **technological transformation** which increases the demand for non routine cognitive and manual skills and reduces demand for routine manual and cognitive skills (skill-biased technical change and polarisation trends) (C. D. Goldin and Katz, 2009; Goos and Manning, 2007; Goos, Manning, and Salomons, 2009). Skill-bias theory sees technology as biased towards raising the demand for high skills rather than replacing them hence leading to better jobs for highly skilled workers.

However, skill-biased theory and its relative human capital theory remain unprecise about the nature of the skills in question, and how technology is related to skills. In most cases they directly understand skills as education credentials (C. D. Goldin and Katz, 2009).

Liu and Grusky (2013) have criticised the skill bias theory literature for being imprecise about how skills relate to technology (Liu and Grusky, 2013). Earlier studies emphasised computer skills and general use of computers and ICT as factors which increased the wage premiums of workers and increased productivity (Brynjolfsson and Yang, 1996; Krueger, 1993). There were, at least two problems with this approach. Firstly, the mere use of computers said very little about the skills in the use of computers that were thought to raise productivity. Moreover, it was clear that there were unmeasured elements to many of these studies that could not be explained in the conventional skill bias theory approach. These elements were referred as unobserved skills. Moss, for instance, hypothesises that there are more salient unobserved characteristics such as rank and status within an organisation to explain the apparent links between computer use and income, arguing that what was being observed is the return to power

and not skill related to technology (Moss, 2002). Acemoglu (2002) also hypothesises that new technologies and rapid organisational changes require (are biased towards) unobserved skills which are actually soft skills related to interpersonal relationships, management skills etc., and not directly related to educational qualifications (Acemoglu, 2002).

The first research gap is related to the previously explained notion of unobserved skills, which have been linked with premiums in terms of job quality. The use of unique cross-national graduate survey data which contain a battery of questions concerning transferable or soft skill required in jobs done by graduates, apart from computer and internet use, made it possible to test what kind of skills exactly are associated with higher job quality. The data base used was far more fine-grained and could explain far better the aspect of unobserved skills than general data-bases like labour force surveys. The multilevel modelling approach made it possible to be even more precise and distinguish the effect of these skills at the individual level e.g. where a particular job required more specific skills than an average graduate in a particular sector of economy, but also effects at sector level, or of the average skill level requirements in the sector on job quality aspects.

The second research gap is about gaining deeper insights into the specific segment of the labour force - the graduate labour force which is the focus of this study. The debate has been largely focused on general labour market trends and job quality stratification and market inequality (high skilled workers vs low skilled workers, men vs women etc.) (C. Goldin and Katz, 2008; Stier, 2015; Stier and Yaish, 2014) ignoring the potential key differences within these large groups e.g. within the group of highly skilled (highly educated) workers (rare exceptions would be: Brown et al., 2012; Holmes and Mayhew, 2015).

Thirdly, research on job quality polarisation has almost entirely ignored the effects that the expansion of education and rising levels of attainment at tertiary level as an independent trend (not as a function of the technological and labour market demand) might have on job

quality levels in different countries and on differences between the job quality levels of highly educated workers in different occupational categories (e.g. Baker, 2014). For example, Baker (2014) has argued for what we might consider a form of reverse causality. While orthodox economists assume that graduate work is a response to the demands of the labour market, Baker argues that the large numbers of graduates that higher education systems have produced have fundamentally changed the nature and demand for work at the management level. This claim can be tested by asking whether increased numbers of higher education graduates in specific sectors of economy are associated with higher or lower job quality. Relatedly, do graduates over time transform jobs if, in the first instance, they are below their skill levels.

4.2 From the macro theories to their operationalisation

From the theoretical discussion outlined in the theoretical chapter of the thesis theory and empirical research identified two main factors which in theory and policy have been seen to have a huge impact on job quality and these are: 1) technological development and increased use of new information and computer technologies and 2) global international trade and processes like offshoring and outsourcing. The impact of these processes on so called high skilled jobs (which almost always means graduate jobs) is highly contested and the research on job quality in this thesis is placed between two broadly contrasting theoretical accounts:

On the one hand, skill-biased technological change theory (Acemoglu, 2002) and the new institutionalism (D. Baker, 2014) provide an optimistic account of the knowledge society and economy which would be of benefit to graduate “knowledge workers” because the new information technologies are skill biased, meaning that they replace only routinized low-skill labour while benefitting knowledge intensive jobs both in terms of quality (more jobs) and quality (more rewarding jobs in terms of skill utilisation, more work autonomy and higher wages). As a result of their highly skilled jobs, according to skill bias theory, graduate workers

may be protected from the potential negative impacts of globalisation, as their jobs are not likely to be offshored or outsourced (Goldin and Katz, 2007, p.138). Both new institutionalism and skill bias technological change theory envisage that an increase in the educational attainment of the labour force will gradually decrease the gap in job quality between graduates employed in different occupational strata.

On the other hand, this positive outlook is contested by the conflict theory of global knowledge capitalism (Brown et al., 2012) which envisages that new technologies, in combination with the globalised economy, will have a deteriorating effect on the job quality of higher education graduates especially in terms of skill utilisation and work autonomy. Professional and managerial knowledge work is seen to be increasingly segmented and routinised in a process of digital Taylorism so that it can be easily be offshored and outsourced. The end result may be the global vertical stratification of graduate jobs in terms of their quality.

As we can see based on this summary of broad theoretical accounts they claim different hypotheses with regard to: 1) what happens with general graduate (high skilled) work quality for majority of graduates employed for example in professional and managerial positions and 2) graduates in the context of higher educational expansion and increased number of graduates ended up in lower occupational positions.

Following these general hypotheses, the analysis in this chapter therefore focuses on the quality of graduate employment of typical higher education graduates working in occupations (managers and professionals) and those in lower occupational categories by raising three questions. Given the chosen multilevel analytical approach and theoretical accounts which focus on graduate job quality in general and in different occupational groups, thesis followed these three analytical steps:

The first concentrated on the individual and contextual sector¹⁸ level factors which are positively and negatively associated with graduates' job quality and the different dimensions of job quality (skill utilisation, work autonomy, income, job security and work-life balance). The key question was to determine the partition of variance in job quality at the level of individual graduate jobs and at the level of employment sector, and then to try to explain these variances with the set of individual and sectoral level variables.

The second step involved investigation question concerns the association between the occupational placement of graduates and their job quality, and investigated how occupationally underemployed workers fare compared to other workers on a variety of job quality dimensions as well on the composite indicator of graduate job quality (GJQI), before and after taking into account individual and sector level variables.

The third step concentrated on the conditions, at the sector level, under which graduates in lower than professional occupational categories have access to better employment in terms of job quality (cross-level interaction). In other words, under which circumstances does the gap in job quality between different occupational groups narrow, and under which circumstances does it widen?

Given these considerations, I will now formalise the relationship between the theories discussed and the hypotheses, derived from these theories, that can be tested with the available data-base and variables.

4.2.1 Skill Biased Technology

The general premise of the skill-bias theory is that technological development and increased use in all sectors of economy is biased in favour of skilled workers and against unskilled workers. This idea has primarily been used to explain wage inequality (C. D. Goldin and Katz,

¹⁸ Only in the case of income as a job quality dimension distinguishing country of employment effects as the third level of analysis improves the overall regression model. For all other dimensions the level of sector of employment is the key macro analytical category and contextual effects are related to that level.

2009; Goos et al., 2009). A more nuanced version of this theory, by Autor, Levy and Murnane (2003), sees that technology might replace human labour mainly in the *routine* tasks but not in non-routine tasks (Autor, Levy, and Murnane, 2003). Hence, the increased use and development of technology leads to rising relative need for well-paid occupations which typically require non-routine cognitive skills and for low paid least-skilled jobs that typically require non-routine manual or interpersonal skills. On the other hand, it leads to falling relative need for the middle occupation jobs that require typically routine manual or routine cognitive skills in the process termed job polarisation (Goos and Manning, 2007; Goos et al., 2009). Regardless of the version of the argument, skill bias theory with its relative human capital theory generally see technological development and its growth as beneficial for highly educated segments of the labour force (professionals and managers), which have the much needed high skill levels to work with new technologies and therefore get rewarded with better job quality not only in terms of income but most of all in terms of skill utilisation.

H1: Levels of technological development and technological growth are positively associated with graduate job quality and its dimensions.

H2: Higher levels of technological development and technological growth have a polarising effect and are widening the gap in job quality between graduates employed as managers and professionals and those in lower occupational categories.

As indicated previously in the discussion about research gaps, less clarity remains about the nature of skills which should attract higher premiums. Computer use, especially, has been used to explain wage premiums (Krueger, 1993), although later a series of authors criticised the sole focus on computer skills arguing that more soft unobservable skills are those that bring the highest premiums in terms of job quality (Acemoglu, 2002; Moss, 2002). The use of computers and internet related technologies has also been seen to contribute to routinisation and hence limit work autonomy (Brown et al., 2012; Goos et al., 2009).

H3: Higher prevalence of computers in a sector and in the work place is associated with higher levels of job quality and its dimensions.

H4: Higher levels of soft skills requirements in a sector and in the work place are associated with higher levels of job quality and its dimensions.

H5: Higher use of computers in a sector and in the work place is associated with lower levels of work autonomy.

4.2.2 Economic globalisation exposure:

Economic globalisation is seen as a force that not only contributes to general competition pressures, outsourcing of manufacturing activities, and lowering working conditions in the developed world, but also changes so-called knowledge work. There are claims that globalisation leads to the deskilling of knowledge work, typically for professionals in the sectors that are growing under the influence of the knowledge economy (Brown et al., 2012). Work within occupational groups like professionals, managers and technicians, which has been seen traditionally as knowledge intensive (and which has employed persons with higher education degrees) is claimed to be increasingly standardised, segmented and reutilised under the influences of digital Taylorism characteristic of knowledge capitalism (ibid, p. 72). The authors claim that this process of the deskilling of knowledge work involves the translation of knowledge workers knowledge, through “capturing, codifying, and digitalising their work in software packages, templates, and prescripts that can be transferred and manipulated by others regardless of location” (ibid, p.72). Hence digital Taylorism is seen as deeply implicated in economic globalisation. In that respect, exposure to globalisation can be seen to have an especially negative effect on skill utilisation and work autonomy.

In addition, globalisation is seen to impact more low skilled workers and those working in lower occupational groups due to increased market competition and with technological advances which combined foster the transfer of more routine work to countries around the

world, creating pressures for a reduction in wages and higher flexibility in the work process (Appelbaum, Bernhardt, and Murnane, 2003; Mills et al., 2008). In this respect it was expected that graduates employed in the sector in which exposure to globalisation is high will also have a high proportion of underemployed graduates and lower graduate job quality.

H6: High level of globalisation exposure in the sectors of economy as well globalisation exposure growth are negatively associated with graduate job quality especially in the dimensions of work autonomy and skill utilisation.

H7: High levels of globalisation exposure and growth in the sectors of economy as well globalisation exposure growth are widening the gap in job quality between graduates employed as managers and professionals and these in lower occupational categories.

4.2.3 Labour market regulation (a variety of capitalism)

Although the focus of analysis in this research is not primarily cross-country comparison due to the chosen multilevel analytical method and limited number of countries in the data set which do not allow significant variance at the country level, labour market regulation is taken as one the control variables at the macro level.

Previous studies have documented important country differences in employment characteristics and work conditions associated with institutional arrangements, mainly labour market regulation and protection and workers' power in terms of union density and collective bargaining (e.g. Esser and Olsen, 2012; D. Gallie, 2008; Duncan Gallie, 2007). While these studies demonstrate the effect of institutional arrangements on the general level of work quality, they do not examine directly diversity in job quality among different groups of workers, such as highly educated workers in different occupational groups.

H8: Labour market regulation is positively associated with graduate job quality and its dimensions.

4.2.4 Educational expansion

The fourth major theoretical contribution to understanding occupational changes in the light of educational expansion is educational institutionalism (D. Baker, 2014). As highlighted before, this approach understands the relationship between education and work as transformative (Meyer, 1977) and that education has a pervasive culture, which results in added-value learning and skills, which in effect change the nature of work, organisations and occupations. Similarly, drawing on a more empirical line of thought, Teichler (2009) points out that in the case of the employment of higher education graduates in occupations which were traditionally reserved for workers with lower occupation levels, the potential penalties in terms of job quality are short-term in nature. In such situations he claims that the dominant long term process occurring is the gradual upgrading of definitions of these occupations because educated workers transform the expectations of they are capable of doing. The macro result of these processes should be the adjustment of occupational structures by the flattening of hierarchies in terms of job demands and skill requirements and general up-skilling of work across job types (Oesch, 2013).

Higher education attainment in the labour force in a particular sector of the economy should therefore be associated with higher job quality and fewer differences in job quality among graduates in different occupational groups (smaller gaps in job quality between graduates in different occupational groups). In such sectors the overall nature and content of jobs is seen to be evolving to allow more skill utilisation and work autonomy suitable for highly educated workers. The rapid expansion of tertiary education attainment in particular sectors, caused by educational expansion and higher intakes of graduates in jobs lower in occupational hierarchies, should be negatively associated with job quality dimensions due to short-term penalties in terms of skill utilisation and other aspects of job quality.

H9: Tertiary education attainment in the labour force in a particular sector of the economy is positively associated with higher job quality and its dimensions.

H10: Tertiary education attainment in the labour force in a particular sector of economy is positively associated with smaller gaps in job quality between graduates in different occupational groups.

H11: Rapid growth in tertiary education attainment in the labour force in a particular sector of economy is negatively associated with job quality and its dimensions.

4.3 Data and method

4.3.1 The graduate survey as a proxy labour market survey

The previous chapter discussed methods for conceptualising and measuring graduate job quality in comparative research, prior to constructing the Graduate Job Quality Index and testing it for validity. As the initial descriptive overview of the statistics indicates, there are differences in graduate job quality across different economic sectors and countries. As already indicated, the descriptive statistics in the previous chapter are based on the graduate survey, which was designed to be representative of the specific graduate cohort in a given country and not the whole graduate labour force. In order to estimate differences in graduate job quality within the graduate labour force specific sets of weights were calculated based on the European Union Labour Force Survey data. Employed workers with higher education aged between 25 and 34 were taken as the weighting reference group in the EU LFS data. The first set of weights calculated were at the individual level, based on the proportion of different occupational groups (ISCO classification 1 digit level) within the reference group in each of the sectors of industry in 17 countries. The second set of weights was designed at sector level and represented the proportion of the reference group of employees within each of the economic sectors in each country. The Statistical classification of economic activities in the European Community

(NACE) proved to be a not particularly useful mechanism for grouping graduates into approximately equal size sectors. Many of the sectors in which large numbers of graduates are employed are meaningful only on the 3rd digit of NACE classification (e.g. legal, bookkeeping and auditing professional services or education sector subdivisions – primary, secondary and higher education). On the other hand some of the sectors of the economy, even when aggregated at the highest 1 digit level, employ only marginal numbers of graduates (e.g. agriculture or mining). The probability of being sampled in a graduate survey and being employed in one of these sectors was extremely low, and calculating weights based on such rare cases would potentially distort findings severely. In order to avoid this the sectors were reclassified by recoding the different levels of NACE classification into the following 18 sectors:

- 1) Manufacturing;
- 2) Construction;
- 3) Wholesale and retail trade; `
- 4) Transport and Communications;
- 5) Financial intermediation;
- 6) Computer related services;
- 7) Research and development
- 8) Legal, accounting, bookkeeping and auditing activities;
- 9) Architectural, engineering and other technical activities;
- 10) Real estate, advertising and other business services;
- 11) Public administration and defense;
- 12) Primary and secondary education;
- 13) Higher education;
- 15) Other education;

- 16) Health;
- 17) Social work;
- 18) Media, culture, recreation, membership organisations.

In the Czech Republic and Spain, the question about sector of employment in REFLEX and HEGESCO data (branches of the economy) was coded only to 1 digit level of the NACE classifications, making it impossible to recode some graduates into this analytical classification. In these countries, graduates employed in health and social services were aggregated, as were graduates employed in the education sector and in the professional services sector (legal, technical, real-estate, computer, R&D etc.). Finally not all sectors were present in the sample of graduates in the graduate survey in some countries (Portugal being one extreme example, in which no one in the graduate sample worked in manufacturing, construction, wholesale and retail trade, etc.). Nevertheless, the total number of sectors of the economy in the 17 countries under analysis was 258, with the majority of countries having all the aforementioned sectors present in their graduate sample.

4.3.2 The weighting procedure for multilevel modelling

The weighting calculation and application was conducted following the weighting manual specific to MLwiN software package (Centre for Multilevel Modelling, 2011). In the single level models researchers need only one set of weights which can be expressed as w_i . Two level models require two sets of weights: 1) W_j cluster level weights, which adjust for unequal probability of the cluster selection (in the case of this research, the sector of economy in which graduates are employed) and 2) W_{ij} which are conditional individual level weights that adjust for the unequal probability of individual selection from within the cluster once the cluster is selected (in this case the graduate with a specific occupation within a specific sector of the economy). In this way, weights used in the multilevel model can be determined as w_{ij} which adjusts both for the individual's unequal probability of selection from among all the

individuals within their cluster, and for the unequal probability of the selection of their cluster from among all clusters in the population. All aforementioned weights are related by:

$$W_{ij} = W_{ijj}W_j \quad (1)$$

The applied method of calculating weights uses selection probabilities. Analogously to the weights, P_j represents the probability of selection of the sector of economy that the graduates belong to from among all sectors in the graduate labour force (employed persons with tertiary education degree aged 25-35). p_{ijj} represents the graduate's probability of selection from among all graduates in the same sector of economy (given that that sector has been selected). Finally, $P_{ij} = P_{ijj}P_j$ represents the graduate's probability of selection from among all graduates in the graduate labour force (i.e. the graduate's probability of selection before sectors have been selected). Probability weights are therefore calculated using EU LFS data as:
 $W_j = 1 / P_j$ (the proportion of each of the sectors within the graduate labour force within each of 17 countries) (2)

$W_{ijj} = 1 / P_{ijj}$ (the proportion of each of occupational groups within each of the sectors of the graduate labour force) (3)

$$W_{ij} = W_{ijj}W_j = 1 / P_{ijj}P_j = 1 / P_{ij} \quad (4)$$

Theoretically speaking, if all higher education graduates in a country worked in the manufacturing sector, the probability of this sector being selected would be 1, while if only 10% of graduates worked in this sector the probability would be 1:10. Analogously, similar weights could be used for the probability that a graduate belonged to a specific occupational category within a sector, a finally overall probability of selection from within a clustered population sample.

Based on these so called raw weights, the MlwiN software package calculates standardised weights. That is, it standardises the weights so that the mean weight for each level 2 unit j is 1.

4.3.3 Dependent variables

The dependent variable is GJQI constructed of 5 dimensions: skill utilisation, work autonomy, income, job security and work-life balance. All variables are rescaled as indexes between 0 and 100 in order to allow easier interpretation of results.

4.3.4 Independent variables

4.3.4.1 Individual level variables

The main independent variable of interest is occupation of graduate worker, which is measured at the individual level measured on the 1-digit level of ISCO88 classification grouped into 3 distinct occupational categories. The “high occupational group” category included managers and professionals; the “medium occupational group” includes technicians and associate professionals; and the “low occupational group” includes clerks and all remaining occupational categories.

The model controlled for 12 individual-level variables grouped into 4 major groups.

Personal characteristics: *Gender* (1 for Female) and *Age* (a continuous variable centred around the mean for each country)

Educational background: *Academic prestige of the programme* (centred around the country mean) and *Vocational orientation of the study programme* (centred around the country mean) based on the question measured on a scale of 1 to 5: To what extent did the following descriptions apply to your study programme: 1) The programme was academically prestigious; 2) The programme was vocationally oriented;

Work features: *Supervision* (1 for having supervisory role at work); *Average working hours* (in a week including overtime (continuous variable centred around the sector mean); *Start year of the current employment* (centred around country mean as a measure of work experience); *Firm size* (centred around sector mean) measured on a 6 point ordinal scale based on the

question: How many people work in your organisation: 1-9; 10-49; 50-99; 100-249; 250-999; 1000 or more;

Skill demands at work: Based on the unique battery of questions in the REFLEX/HEGESCO questionnaires, respondents were asked to respond on a 7 point scale to say how much 20 generic skills are required at their job. Based on these 20 items, factor analysis was performed using principle component extraction. The initial solution indicated that use of language skills and use of computers and the internet do not correlate with any underlying factors, therefore they were excluded from further factor analysis. *Computer and internet use skill requirement* (scale between 1 and 7 - centred on sector mean) was used as a separate independent variable at the individual job level in order to test the use of ICT at work.

Based on factor analysis (principle component extraction and Varimax rotation, KMO= 0.942) of the remaining 18 skill items, 3 distinct factors were identified:

Factor 1: *Teamwork, leadership and management work demands* (ability to negotiate efficiently; ability to perform well under pressure; alertness to new opportunities, ability to coordinate activities; ability to use time efficiently; ability to work productively with others; ability to mobilise capacities of others; ability to make your meaning clear to others; ability to assert own authority);

Factor 2: *Communication and innovation work demands* (ability to come up with new ideas and solutions; willingness to question own and others' ideas; ability to present products, ideas or reports to an audience; ability to write reports, memos and documents);

Factor 3: *Mastery of disciplinary knowledge and analytical skills* (mastery of own field or discipline; knowledge of other fields and disciplines; analytical thinking; ability to rapidly acquire new knowledge).

All three factors showed strong internal validity (Cronbach's alpha 0.87; 0.8 and 0.71 for each factor respectively) and at the end they were extracted as regression factor variables with

variables of 0 as a mean value and 1 being one standard deviation. For the purposes of multilevel modelling these variables were also centred around sectoral means.

4.3.4.2 Sector level variables

Technological level and technological growth: Several indicators were considered for measuring macro-level characteristics. The technological level of a country, a key indicator in the current study, was based on the **ArCo Technological Capabilities Index** (Archibugi and Coco, 2004 and Archibugi and Coco, 2005), which takes into account three dimensions of technology: innovative activity (based on patents registration and scientific publications); technology infrastructure; and the level of human capital. It was constructed for two decades (1990s and 2000s). The 2000s measure denotes the level of technological development and the growth rate (in percentage) from the past to the more recent period to capture technological change. Both variables represent country level indicators and thus have the same value for each of the sectors within one country. As a measure of the *ICT penetration and use* at the level of the economic sector, the sector level variable was derived as a mean of the individual level variable (use of computers and internet in current work based on the REFLEX HEGESCO questionnaires).

Globalisation exposure and globalisation exposure growth: Complex processes like globalisation are extremely difficult to operationalise in a single variable. Even more difficult is to construct a data source at the level of industrial sectors that can be used as a proxy for the level of globalisation exposure in sectors, and a time series useful for calculating the growth in globalisation exposure. The input-output global trade tables systemically collected by OECD were the most suitable proxy measure of the extent to which specific sectors of the economy are exposed to the processes of globalisation (creation of global value chains, outsourcing and out-contracting activities and global trade). For the purposes of this research, *the imports content of exports indicator* were taken as the measure of globalisation exposure and represent

the degree of vertical specialization. This indicator represents the contribution that imports make in the production of exports of goods and services in each specific sector of the economy (OECD offers the data based on the 1 digit NACE classification of sectors of economic activity).

The respective figures for this indicator were taken for each of the sectors in the relevant survey years (2005 for REFLEX countries and 2008 for HEGESCO countries). *Globalisation exposure growth* variables were calculated based on the same indicator change in the period of 10 years (by subtracting figures for 1995 and 1998 from the globalisation exposure indicator).

Tertiary education attainment in the sectors and tertiary education attainment growth:

In order to test the institutionalism set of hypothesis, the percentage of all employees with tertiary education level for each sector of the economy in each country was taken into account for 2005. The measurement of sectoral tertiary education attainment growth was derived from the increase in the aforementioned percentage in the previous 3 years (2005 compared to data from 2002). The data is based on the EU LFS custom made tables provided to the author by EUROSTAT. Data from 2005 (and 2002 for the growth variable) were taken as the reference point also for Slovenia, Lithuania, Poland and Hungary despite the fact that the graduate survey in these countries was conducted in 2008. This is due to significant changes in international classification of sectors of economic activities that were introduced in 2005, which break the time series and limit the comparability of data from 2005 and 2008.

Labour market regulation: As outlined before, the quality of work in part varies due to the macro-regime characteristics of countries which determine the level of job security and flexibility, industrial relations and overall skill reward system. The *OECD Employment protection index* was taken as a single control variable that indicates the level of labour market regulation in different countries. The OECD index of employment protection legislation measures the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers on fixed-term or temporary work agency contracts.

The indicator was compiled based on the OCED reading of statutory laws, collective bargaining agreements and case law as well as contributions from officials from OECD member countries and advice from country experts.

Overall work demands in the sector: In order to test if the overall skill requirements and type of work demands has any association with the overall job quality for graduates in the sector and occupational differences in job quality, 3 sector level variables were derived from the skill demand factors explained as the individual level variables in the previous section. The sector level variables were calculated as the mean of each skill demand factor in a specific sector of economy:

Sector mean: *Teamwork, leadership and management work demands*

Sector mean: *Communication and innovation work demands*

Sector mean: *Mastery of disciplinary knowledge and analytical skills*

4.3.5 Method of analysis

The study was based on multilevel modelling which makes it possible to test for micro (individual level) and macro-level effects (sector level) and their interaction. Besides finding out the significance and extent of individual and sectoral level effects on job quality and its dimensions, the use of multilevel modelling approach allows much deeper analysis. The key interests of this research were occupational differences (occupational gap or penalty) in job quality among higher education graduates employed in different sectors of economy in 17 European countries, and how contextual effects (use of technology, globalisation exposure, level of educational expansion in the sector and labour market regulation) influence that gap. In which sectors and under which sectoral level characteristics does that gap in job quality widen or get narrower? The multilevel regression modelling method makes it possible to model simultaneously the effects of sector-level characteristics on job quality measures while controlling for individual-level characteristics (Raudenbush and Bryk, 2002). More

importantly, this method allows testing for whether the individual-level effect of occupational grouping on job quality differs across sectors of the economy, and, when applicable, cross-nationally, and how this variation is associated with sector-level characteristics. Thus, a two-level model allows the researcher to define any number of individual-level variables as random variables and in this case different occupational categories, which are then regressed on the sector and social level variables.

4.3.5.1 Analytical strategy

Multilevel modelling builds the model from the single model which does not allow random effects on sector and country level. The start is the null model without any explanatory variable (not presented here). Building on the key importance of different occupational groups the occupation variable is included in the modelling from the very beginning creating the start basic model. The basic single level regression model in this case is following:

$$GJQI_i = \beta_{0i} + \beta_1(\text{Professionals and managers})_i + \beta_2(\text{Lower occupations})_i + \varepsilon_i \quad (1)$$

The model in this case estimated job quality (or its dimensions) for an intermediate occupational group (associate professionals) for an individual i while other two occupational groups were entered as dummies and their coefficients (β_1 and β_2) represented coefficients of job quality in these specific occupational categories compared with intermediate occupations.

Analytical strategy starting from the basic model outlined above and followed 5 main steps:

Step 1 Random intercept model: Firstly, intercept (β_0) was allowed to be random on the sector level (j) and country level (k) to establish the validity and statistical significance of the two or three level solutions for estimating GJQI and each of its dimensions and to estimate overall variance at each of these levels.

$$GJQI_{ij} = \beta_{0ij} + u_{0j} + \beta_1(\text{Professionals and managers})_{ij} + \beta_2(\text{Lower occupations})_{ij} + \varepsilon_{ij} \quad (2)$$

Step 2 Random intercept model and individual level control variables: After establishing the better potential fit of the multilevel models compared to the single level models and variance partition on each of these models, a set of individual level control variables were introduced as follows:

$$GJQI_{ij} = \beta_{0ij} + u_{0j} + \beta_1(\text{Professionals and managers})_{ij} + \beta_2(\text{Lower occupations})_{ij} + \beta X + \varepsilon_{ij} \quad (3)$$

The first is a within-sector equation where the job quality of individual *i* in sector *j* is the dependent variable; β_{0ij} denotes the general intercept while u_{0j} denotes the (sector specific) intercept; β_1 and β_2 represent the effect of the occupation variable (two dummy categories) ‘Professionals and managers’ and ‘Lower occupations’ and the vector *X* denotes all the other 12 individual-level control variables, β represents their coefficients, and ε_{ij} is the error term.

Step 3 Random intercept model and both individual and contextual control variables: The next modelling step was the introduction of contextual effects aiming to explain between-sectors variation with the sector-level characteristics (12 variables explained in the previous section), as presented in the following equation (4):

$$GJQI_{ij} = \beta_{0ij} + u_{0j} + \beta_1(\text{Professionals and managers})_{ij} + \beta_2(\text{Lower occupations})_{ij} + \beta X + \beta S + \varepsilon_{ij} \quad (4)$$

As we can see the only difference between equation 3 and 4 is the vector βS which *S* denotes all the other 12 sector-level contextual variables and β their coefficients. They are not presented individually here individually in the model due to the high number of variables, In this way the

main contextual effects on job quality and its dimensions were estimated (effects on the intercept).

In Equation 4 the variation in job quality across sectors (variation in the intercept) was modelled as a function of contextual factors (e.g., globalisation exposure, globalisation growth, technology level and technology growth; use of computers in the sector, level of regulation, tertiary educational attainment and its growth in the sector etc.). A negative sign of any β_S related with sector level of globalisation exposure, for instance, supports the claim that sectors with a higher level of globalisation exposure enjoy worse quality graduate jobs.

Step 4: Random slope models on each of occupational groups

In the next step the both the intercept and the occupational coefficients (β_1 and β_2 , respectively) were allowed to vary across sectors, while the effects of the control variables are constrained to be the same across sectors. In practice, random slopes for each of the occupational groups were allowed one by one to test their significance and see if the occupational job quality gap varied for these specific occupational groups varied across sectors (equations 5 and 6)

$$GJQI_{ij} = \beta_0_{ij} + u_{0j} + \beta_{1j}(\text{Professionals and managers})_{ij} + \beta_{2j}(\text{Lower occupations})_{ij} + \beta X + \beta S + \varepsilon_{ij} \quad (5)$$

$$GJQI_{ij} = \beta_0_{ij} + u_{0j} + \beta_{1j}(\text{Professionals and managers})_{ij} + \beta_{2j}(\text{Lower occupations})_{ij} + \beta X + \beta S + \varepsilon_{ij} \quad (6)$$

Step 5: Cross-level interactions

The last step (equation not depicted here due to many variables in the model) was to try to estimate if any of sector level characteristics explain the occupation variance (gap) in job quality between sectors. This was achieved by introduction of cross-sector interaction terms between the sector level explanatory variables which had a significant main effect on the intercept (equation 4) and dummy occupational variables. The interaction effects between

sector level characteristics and occupational dummy variables were estimated for each of the contextual (sector level) main effects separately, in order to estimate whether some of the contextual effects are associated with widening or narrowing the gap in job quality between graduates employed in different occupational groups.

4.4 Findings

4.4.1 Descriptive overview

Table 8 presents the average values of GJQI100¹⁹ and the five job quality dimensions by different occupational groups. The ISCO88 categories for occupations were collapsed into 3 major groups: the top group made of managers and professionals, the medium group made of technicians and associate professionals and the lowest group, in which are clerks and all other occupational categories (skilled, craft and service workers as well as elementary occupations). The figures show substantial and statistically significant differences between the 3 occupational groups of graduate workers (based on t-tests at the 0.05 level) in overall job quality, skill utilisation, work autonomy, income and job security. The differences follow occupational hierarchies and the highest mean values are in the top categories, while the lowest are in the lowest occupational categories. For instance, the differences in the overall job quality range was between 66.60 for managers and professionals and 51.06 for clerks and lower occupational groups, with technicians and associate professionals being in the middle with 62.61. In the case of job security, the differences in mean values were again statistically significant, however technicians and associate professional jobs showed the highest levels of job quality, followed by managers and professionals and then clerks and lower occupations. In the case of work-life balance only the differences between the highest and medium occupational groups were statistically significant while there were no statistically significant

¹⁹ For the purposes of easier interpretation the index, which was originally designed between 0 and 1, was rescaled to be between 0 and 100. The same rescaling was done for 5 job quality dimensions. One should note that the values 0 and 100 do not represent the absolute absence of job quality or absolute maximum job quality. They are only maximums and minimum values within the survey sample.

differences between the lowest occupational group and the two higher groups. Graduates working as associate professionals and technicians are closer or even higher in some values to the group of graduates working as managers and professionals than to the group of clerks and lower occupations indicating that the pattern of occupational differences is not completely linear.

Table 8: Mean (standard deviation) of job quality dimensions by major occupational groups

	GJQI100*	Skill utilisation*	Autonomy*	Income*	Job security*	Work-life balance**
Managers and professionals	66.60 (12.50)	77.09 (23.35)	80.78 (18.99)	20.65 (9.32)	69.19 (29.99)	57.65 (26.48)
Technicians and associate professionals	62.61 (14.33)	70.41 (26.21)	76.48 (20.88)	17.95 (7.85)	70.33 (28.75)	58.85 (26.38)
Clerks and lower occupations	51.06 (18.02)	52.13 (31.59)	64.89 (26.33)	15.29 (7.20)	67.44 (31.01)	57.74 (27.19)
N	25854	31488	29786	27561	30202	30006

* Differences between each pair of occupational groups are significant at the 0.05 level.
 ** Differences between highest and medium occupational groups are significant at the 0.05 level.

The means presented in the table above, although broadly indicating the extent of differences between occupational groups, do not indicate individual and contextual factors which are associated with lower or higher levels of job quality in different occupational groups nor do they tell about conditions under which occupational differences in job quality widen or narrow. To test the aforementioned hypotheses about contextual effects on job quality and its dimensions in general and on occupational inequality in job quality, a multilevel analysis was applied.

4.4.2 Initial multilevel models and variance partition

The following represents results from the first analytical step (random intercept models) described above. For all outcomes (job quality dimensions), the variance between clusters was statistically significant, which justifies the choice of multilevel models over single level ones,

indicating the natural clustering of graduates within the sample into sectors of economic activity (258 sectors) and into countries (17) (model results for single level models are available but are not presented here). Due to the limited number of countries, variance at country level was limited, so for the majority of job quality dimensions (skill utilisation, work autonomy, job security and work-life balance) and GJQI, the two level basic models²⁰ (individual nested in sector of employment) represented the best fit. In the case of income there was in general more variance at the country level than at the level of the employment sector, so the 3 level model (individual – sector of economy – country of employment) represented the best fit compared to single level models or two level models. The income variable, which represents the hourly wage (Euros) in purchasing power parities (PPP) accounts for 43.32% at the country level, indicating that salary differences are explained much better by the country in which graduates work than by the type of jobs or the sector of employment.

The Table 9 shows the partition of variance across levels of individuals, sector of economy and country of employment (only applicable in the case of income variable). As one can see, the biggest variation in job quality (GJQI), skill utilisation, work autonomy, income, job security and work-life balance reported by graduate workers emerged between individuals. Variance at the sector of economy level was highest in the case of work-life balance (9.74%), followed by job security (8.42%), work autonomy (8.36%), income (8.12%), GJQI (7.25%) and skill utilisation (7.04%). A similar low level of variance at the second level of analysis in job quality dimensions was consistent with other analysis based on multilevel modelling of job quality elements using ISSP data (Stier, 2015; Stier and Yaish, 2014). After introducing the 12 individual level explanatory variables into the basic regression model, the proportion of unexplained variance on the individual level reduced, as expected, while the amount of

²⁰ The basic model is described in the previous section on models and it implies GJQI and other dimensions of job quality as dependent variables, while occupational categories (with medium occupation group of technicians and associate professionals as reference group).

variance at the sectoral level remained the same or slightly increased. The selected individual variables (explained and listed in the previous sections) explained up to 19.52% of the variance at the individual level in the case of GJQI, while they had the least explanatory power in the case of job security (only 5.70%). Such small percentages indicate that there are other unobserved factors at the individual job level that are associated with job quality dimensions (e.g. psychological or factors related to job environment or organisation/company characteristics).

Graduate job quality in the social context

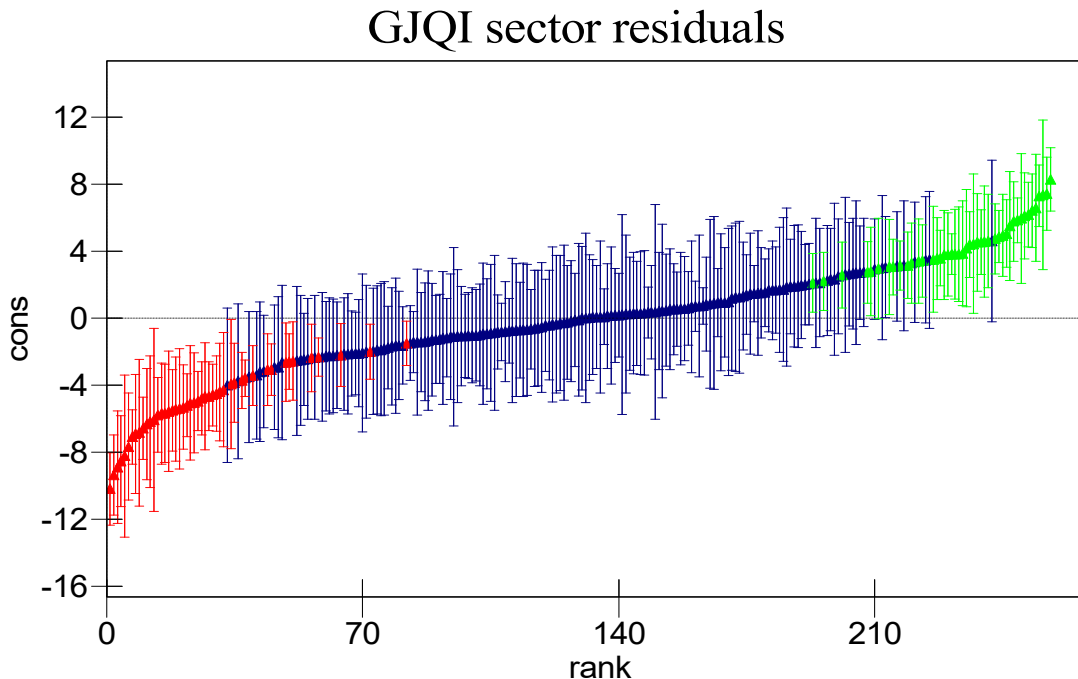
Table 9 : Variance partition of multilevel models by job quality dimensions

	GJQI100	Skill utilisation	Autonomy	Income	Job security	Work-life balance
<i>Total graduate labour force</i>						
Level 3: Country of Employment	N.A.	N.A.	N.A.	33.67	N.A.	N.A.
Level 2: Sector of economy	13.27	44.72	32.07	6.80	75.59	67,65
Level 1: Individual	169.82	590.46	351.75	43.32	821.99	626,63
% of variance due to level 2	7.25%	7.04%	8.36%	8.12%	8.42%	9,74%
% of variance at level 3	N.A.	N.A.	N.A.	40.18%	2.58%	N.A.
<i>Total graduate labour force controlling for 12 individual level variables</i>						
Level 3: Country of Employment	N.A.	N.A.	N.A.	33.08	N.A.	N.A.
Level 2: Sector of economy	13.92	43.02	31.57	6.54	58.89	73,31
Level 1: Individual	136.67	501.95	286.43	38.67	728,35	572,19
% of level 1 variance explained by 12 individual level variables	19.52%	14.99%	18.57%	10.73%	5.70%	8,69%

4.4.3 Sector level residuals

In the previous section it was concluded, among other things, that differences in graduate job quality remain even after controlling for a set of 12 individual level variables. The best way to illustrate the magnitude of sector level effects is to calculate and chart an estimate for each of 258 sectors that gives their difference in job quality from the average. These estimates are also called sector level residuals in the random intercept model after controlling for individual level factors. The following chart (Figure 11 below) shows the distribution of the sector level residuals according to the rank (the sector with the best graduate job quality with the largest rank, and the sector with the lowest graduate job quality ranked as 1). Approximately one sixth of the sectors (45 out of 258) have significantly better graduate job quality ($p < 0.05$) than average (those for which the confidence intervals do not cross the dotted line, and the points lie above the line). These sectors are highlighted in green. Another one sixth of the sectors (44 out of 258) have significantly worse graduate job quality ($p < 0.05$) than average and they are highlighted in red. The confidence intervals around predicted sector level effects vary greatly in their length reflecting the difference in the graduate samples in sectors of the economy and within graduate surveys in specific countries. Smaller sectors with fewer graduates in the sample will have longer intervals than larger sectors (e.g. all sectors in Czech Republic).

Figure 11; Sector level residuals on GJQI for 258 sector of economy after controlling for individual level variables



Among 45 sectors with estimated job quality of above average (marked green in Figure 11), the sector with the highest job quality for graduates after controlling for all individual level variables was primary and secondary education in Finland (estimated residual 8.28 above average), followed in precise order by: 1) Higher education in the Czech Republic; 2) Other education in Norway; 3) Social work in Norway; 4) Primary and secondary education in Portugal; 5) Primary and secondary education in Germany; 6) Primary and secondary education in Norway; 7) Social work in Finland; 8) Research and development in Norway; 9) Education in Spain; 10) Higher education in Norway; 11) Higher education in Estonia; 12) Primary and secondary education in France; 13) Higher education in Belgium; 14) Primary and secondary education in Slovenia; 15) Primary and secondary education in the UK; 16) Higher education in Austria; 17) Financial intermediation in Finland; 18) Health in Finland; 19) Health in Portugal; 21) Higher education in Portugal; 22) Higher education in Finland; 23) Research and development in Austria; 24) Legal, accounting, bookkeeping and auditing services in Finland;

25) Media, culture, recreation and membership organisations in Finland; 26) Primary and secondary education in Italy; 27) Primary and secondary education in the Czech Republic; 28) Primary and secondary education in Lithuania; 29) Primary and secondary education in Hungary; 30) Public administration in Finland; 31) Primary and secondary education in Belgium; 32) Primary and secondary education in Poland; 33) Higher education in the Netherlands; 34) Other education in Slovenia; 35) Other education in the Czech Republic; 36) Health in Norway; 37) Health and social work in Spain; 38) Health in Belgium; 39) Computer related services in Slovenia; 40) Legal, accounting, bookkeeping and auditing services in Austria; 41) Public administration in Norway; 42) Social work in the Netherlands; 43) Media, culture, recreation and membership organisations in Spain; and finally 44) Health in Slovenia.

Among the 44 sectors with estimated job quality below average (marked red in Figure 11), the sector with the lowest estimated job quality for graduates after controlling for all individual level variables was the transport and communications sector in Spain, with an estimated residual 10.24 below average. It is followed in precise order by: 1) Wholesale and retail trade in Spain; 2) Wholesale and retail trade in the UK; 3) Computer related services in Italy; 4) Transport and communications in Hungary; 5) Transport and communications in France; 6) Manufacturing in Italy; 7) Computer related services in France; 8) Wholesale and retail trade in Hungary; 8) Public administration in Poland; 9) Transport and communications in Italy; 10) Construction in Italy; 11) Real estate, advertising and other business activities in Hungary; 12) Financial intermediation in Italy; 15) Wholesale and retail trade in Poland; 16) Construction in Hungary; 17) Wholesale and retail trade in France; 18) Construction in the Netherlands; 19) Architectural, engineering and other technical services in Italy; 20) Financial intermediation in the Czech Republic; 21) Media, culture, recreation and membership organisations in Italy; 22) Manufacturing in Hungary; 23) Manufacturing in Spain; 24) Manufacturing in Poland; 25) Financial intermediation in France; 26) Manufacturing in France;

27) Transport and communications in the Czech Republic; 28) Legal, accounting, bookkeeping and auditing services in Italy; 29) Financial intermediation in the UK; 30) Real estate, advertising and other business activities in Italy; 31) Wholesale and retail trade in Germany; 32) Computer related services in the Netherlands; 33) Public administration in Slovenia; 33) Manufacturing in the Czech Republic; 34) Wholesale and retail trade in the Czech Republic; 35) Real estate, advertising and other business activities in the UK; 36) Financial intermediation in Slovenia; 37) Manufacturing in Slovenia; 38) Manufacturing in the UK; 39) Construction in Spain; 40) Business activities – unspecified in the Czech Republic; 41) Public administration in Spain; 42) Legal, accounting, bookkeeping and auditing services in Poland and finally 43) Financial administration in the Netherlands.

As we can see, the difference between highest and lowest ranked sector in graduate job quality is substantial (more than 18 points on the 100 point scale of GJQI). Some sector-types, regardless of what country they are in, were characterised by high job quality for graduates (e.g. primary and secondary education, health). Similarly, transport and communications, wholesale and retail trade, manufacturing and construction, regardless of country, were marked by lower than average graduate job quality. On the other hand, some sector-types varied substantially between countries. Graduate jobs in public administration in Poland, Slovenia and Spain were among the worst, while in Finland and Norway they were among the best. Similarly, the financial intermediation sector was below average in terms of job quality in Italy, the Czech Republic, the UK, France, Slovenia and the Netherlands, but above average in job quality in Finland. Legal, accounting, bookkeeping and auditing activities in Italy and Poland are below average in terms of graduate job quality, while in Finland and Austria they are clearly above average. As was pointed out earlier, despite some country variance in job quality in some sectors of the economy, this variance is not statistically significant to fit the three level multilevel regression models (country – sector – individual) with the exception of the income

dimension of job quality. In other words, data seem to be clustered within sectors of the economy and not within countries of employment.

4.4.3.1 Checking the model assumptions

Another analytical purpose of calculating the sector level residuals was their usefulness for testing for multilevel model assumptions of normality and homoscedasticity (that the variance of residuals is constant across all values of covariates). Assumptions of normality were checked by plotting standardised residuals (at the sector and individual level) against the normal scores for each of job quality dimensions. Figure 12 (below), for instance, shows the distribution for sector level residuals of GJQI. The residuals lie perfectly on the diagonal line $y = x$ which would indicate the highest possible conformity to the normal distribution.

Homoscedasticity assumptions were checked by plotting the residuals at each level against the fixed part of the model (all other variables) in order to check whether the variance increased across the x axis (predicted values for job quality) (Table 13 below), for instance, illustrates this for individual level residuals of GJQI, and shows that they are the same distribution across x axes so the assumption of homoscedasticity seems valid.

Figure 12: Normal scores and standardised residual plot for sector level residuals of GJQI

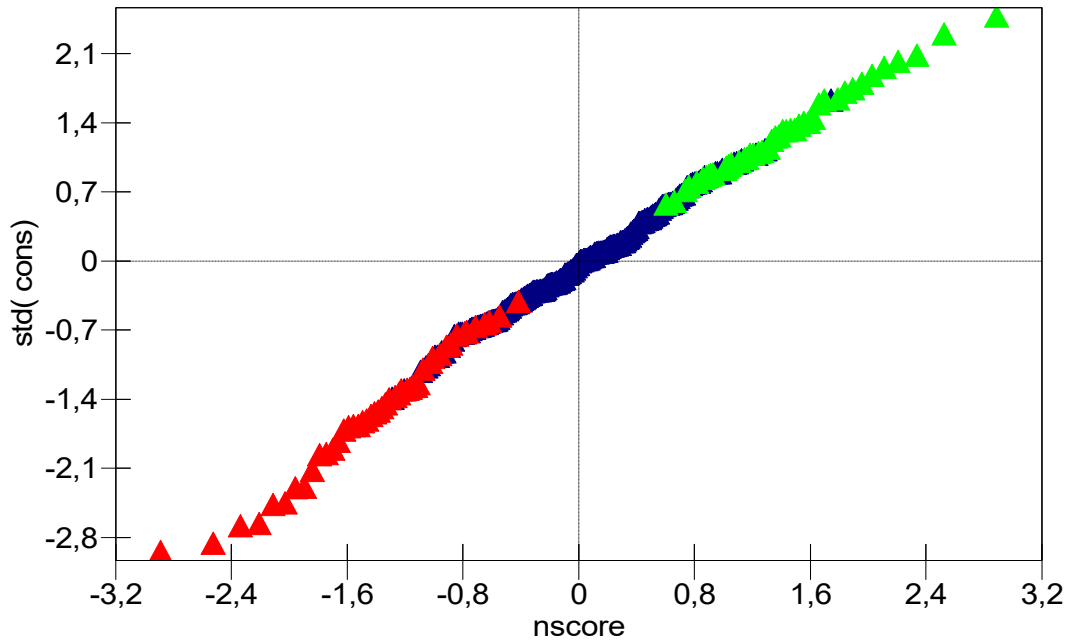
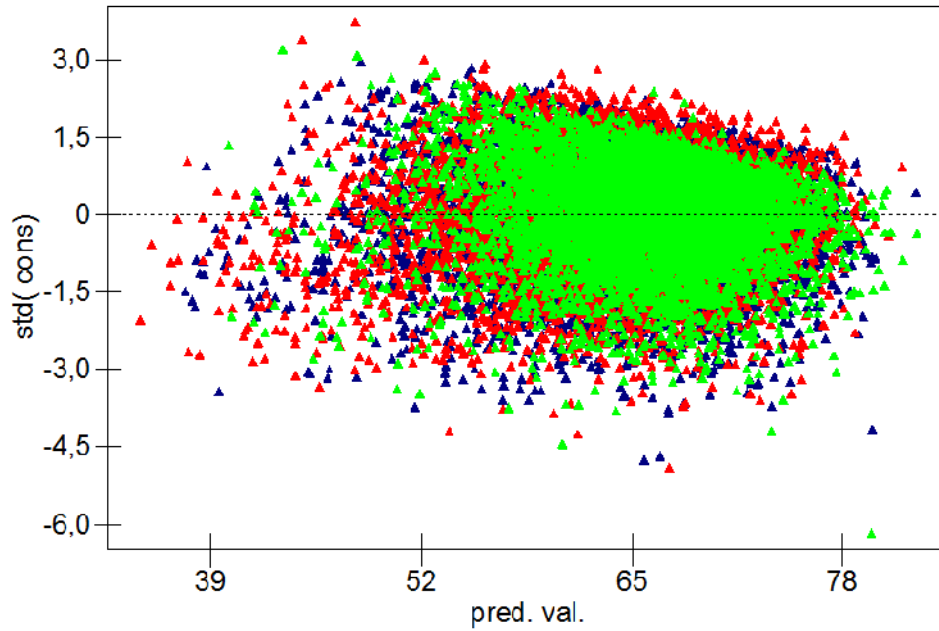


Figure 13: Individual level residuals for GJQI (standardised residual x fixed part prediction)



4.4.4 Individual and sector level effects on graduate job quality and its dimensions

The following section summarises the main results of the multilevel regression modelling of the graduate job quality index (GJQI) and its dimensions (skill utilisation, work autonomy, income, job security and work-life balance). These represents the results on the analytical steps 2 and 3 outlined above. The key research interest follows the first two aforementioned analytical sub-questions: firstly, which individual and sector level variables best explain the variance in job quality and its dimensions and secondly, what is the effect of the occupational placement of graduates in different sectors on different dimensions of job quality?

4.4.4.1 Occupational group differences

Turning first to the effect of graduates' occupation on the different measures of job quality, Table 10 suggests, as expected, that independent of all individual and contextual sector level characteristics, graduates working as managers and professionals have a clear and significant advantage in overall job quality (GJQI), skill utilisation, work autonomy and income compared to graduates working as associate professionals and technicians (the reference category). In other words occupational gap in job quality is relatively stable phenomenon. On a 100 point scale, they had the greatest advantage in terms of skill utilisation (column 2, $\beta = 3.771$), followed by income (column 4, $\beta = 2.053$), overall job quality GJQI (column 1, $\beta = 2.020$) and work autonomy (column 3, $\beta = 1.530$). Graduates working as clerks and in lower occupational groups had the lowest job quality on the same job quality measures. Compared to the reference group of associate professionals they were disadvantaged in the domain of skill utilisation (column 2, $\beta = -11,810$), overall job quality GJQI (column 1, $\beta = -6.693$), work autonomy (column 3, $\beta = -5.195$) and income (column 4, $\beta = -2.428$). Differences between graduates working as professionals and managers and graduates working as clerks and in lower occupational categories (not shown here) were also significant in all measures. In

terms of the job security and work-life balance dimensions there were no significant differences between graduates in different occupational groups.

4.4.4.2 Individual level effects

Before addressing the main interest of the analysis, which lies in macro or sector/country effects on job quality and its dimensions, some individual-level relationships deserve mention (Table 10, below).

First, there were no significant gender differences in the overall level of job quality, skill utilisation and work autonomy or work-life balance. A relatively small (less than two points on the 100 point scale) but significant difference remains valid only in the case of income ($\beta = -1.812$). Female graduates, even after controlling for all individual and sector level variables are paid less than their male colleagues for the same work. On the other hand, female graduates might get compensation for lower pay in terms of job security, in which female graduates reported significantly ($p < 0.1$) more secure jobs ($\beta = 2.036$).

Second, older than country average graduates are more likely to enjoy greater work autonomy and income. However this effect was expected, because these graduates are probably in more advanced stages of their careers. The effect of age, although significant, was very small. One year of age is associated with an increase of 0.162 points in income and 0.142 points in work autonomy. Graduates older than the average in their country are, however, more likely to have less secure jobs ($\beta = -0.344$). Again this effect, although significant, was relatively small.

Thirdly, overall job quality ($\beta = 1.520$), work autonomy ($\beta = 5.481$), income ($\beta = 1.970$) and job security ($\beta = 2.651$) was higher for graduates holding supervisory roles. On the other hand these graduates had a worse work-life balance ($\beta = -2.701$). There was, however, no significant difference in terms of skill utilisation between graduates in supervisory roles and those not supervising others.

Working longer hours than sector average is a sign of precarious work, as it is associated with lower skill utilisation, income, job security and a worse work-life balance. Again the effects, although statistically significant, were relatively small. One extra hour of work per week more than other graduates in the same sector, was associated with a -0.062 point decrease in income, -a 0.083 point decrease in job security and a -0.526 point decrease in work-life balance.

The unique benefit of using graduate survey data as a proxy graduate labour force survey is that effect of characteristics of completed higher education study programmes on subsequent success in the labour market can be assessed. Graduates who completed study programmes that they assessed to be more academically prestigious than the average in their country are getting a premium in all aspects of job quality. The highest premium seems to be in the terms of skill utilisation, followed by job security, work-life balance, and income and finally work autonomy. Graduating from a more than average vocationally oriented study programme is, on the other hand only associated with higher skill utilisation, which was expected due to the stronger link between education and potential work requirements, and with higher levels of job security, while in other job quality dimensions a more than average vocationally oriented study programme brings no added premium.

With regard to the other work related characteristics of individuals, graduates who more recently started work compared with the rest of their country sample experienced lower skill utilisation, less job security and less autonomy at work. This was as expected, and may be because they are more likely to be in the probationary stages of their employment or undergoing initial in-job training. Again, the effects, although statistically significant, were relatively small.

Graduates employed in larger companies or organisations experience less work autonomy ($\beta = -1.142$) and skill utilisation ($\beta = -0.428$), but higher job security ($\beta = 1.407$) and better pay ($\beta = 0.534$).

Finally, work demands in terms of soft and transferable skills seemed to have the strongest association with a majority of dimensions of job quality and hence the strongest explanatory power at the level of individual graduate jobs. Graduates whose jobs demand higher use of transferable and soft skills compared with average graduate jobs in the same sector are rewarded with higher job quality in almost all aspects. Graduate jobs which require more than sector average levels of teamwork and management and leadership skills are associated with significantly lower work-life balance, but with much higher work autonomy, job security, skill utilisation and finally income. Jobs which require more than sector average communicative skills, creativity and innovation also bring greater work autonomy, skill utilisation, income and better work-life balance. Finally and most importantly, graduate jobs which require more than sector average mastery of study discipline related knowledge and analytical skills are understandably highly associated with skill utilisation, but also strongly with higher levels of work autonomy, income and better work-life balance. On the other hand, graduates who use the internet and computers at work more than their sector colleagues do not get any job quality premiums apart from slightly higher job security. These findings, concerning the type of skills and work demands which are associated with job quality premiums, shines a sceptical light on the classical skill-biased technology interpretation of wage premiums. However, this point is discussed in greater depth in the discussion section.

Table 10: Results of a multilevel regression predicting job quality among graduates in 258 sectors of the economy in 17 countries: individual level explanatory factors (due to the high number of variables the results of the final model were presented in different sections in several tables)

	GJQI100	Skill utilisation	Autonomy	Income	Job security	Work-life balance
Intercept	54.898*	72.267*	58.078*	-13.254*	55.402*	54.862*
	(-4.911)	(8.359)	(7.916)	(7.739)	(13.299)	(11.966)
Individual level variables						
Clerks and lower occupations	-6.693*	-11.810*	-5.195*	-2.428*	-1.550	1.086
	(-1.073)	(2.027)	(1.293)	(0.532)	(1.778)	(1.342)
Professionals and managers	2.020*	3.771*	1.530*	2.053*	-0.447	-1.409
	(0.423)	(0.831)	(0.582)	(0.312)	(1.060)	(0.943)
Female	0.311	0.202	0.305	-1.812*	2.036**	0.335
	(-0.400)	(0.750)	(0.523)	(0.227)	(1.067)	(0.687)
Age-m(Country)	0.075	0.144	0.142*	0.162*	-0.344*	-0.147
	(0.054)	(0.099)	(0.055)	(0.035)	(0.121)	(0.103)
Supervision	1.520*	-0.095	5.481*	1.970*	2.651*	-2.701*
	(0.561)	(1.170)	(0.518)	(0.239)	(0.815)	(0.722)
Hours of work - m(Sector)	-0.045*	0.049	0.050*	-0.062*	-0.083*	-0.526*
	(0.019)	(0.037)	(0.022)	(0.010)	(0.036)	(0.034)
Academically prestigious study programme	0.929*	1.502*	0.407**	0.531*	0.964*	0.697**
	(0.149)	(0.291)	(0.234)	(0.103)	(0.483)	(0.362)
Vocationally oriented study programme	1.338*	2.769*	0.012	-0.117	1.324*	0.226
	(0.220)	(0.335)	(0.257)	(0.115)	(0.502)	(0.296)
Year of the start of the current job-m(Country)	-0.1580*	-0.093	-0.110**	-0.035	-0.922*	-0.034
	(0.060)	(0.116)	(0.066)	(0.040)	(0.146)	(0.113)
Firm Size-m(Sector)	-0.227**	-0.428**	-1.142*	0.534*	1.407*	0.169
	(0.129)	(0.251)	(0.146)	(0.076)	(0.274)	(0.221)
Teamwork, Management, Leadership - m(Sector)	0.888*	1.069*	2.650*	0.325*	1.235*	-2.623*
	0.206	(0.400)	(0.303)	(0.107)	(0.436)	(0.400)
Communication, Innovation, Creativity - m(Sector)	3.156*	4.173*	4.969*	0.671*	0.317	1.805*
	(0.255)	(0.492)	(0.336)	(0.175)	(0.537)	(0.414)
Discipline related and Analytical Skills - m(Sector)	3.706*	6.832*	3.775*	0.317*	0.500	0.903*
	(0.329)	(0.575)	(0.292)	(0.100)	(0.489)	(0.426)
Use of Computers and Internet-m(Sector)	-0.001	0.039	-0.346	-0.064	0.851*	0.444
	(0.205)	(0.411)	(0.237)	(0.053)	(0.344)	(0.319)

* p < 0.05

** p < 0.1

4.4.4.3 Sector level effects

We now come to the main interest of the analysis, which lies in the macro sector and country effects on job quality and its dimensions.

Table 11: Results of a multilevel regression predicting job quality among graduates in 258 sectors of economy in 17 countries: macro level explanatory factors (continuation of previous results table)

	GJQI100	Skill utilisation	Autonomy	Income	Job security	Work life balance
<i>Contextual factors</i>						
Computer Use (Sector Mean)	-0.853** (0.594)	-2.083** (1.127)	-0.412 (1.028)	1.265* (0.665)	1.761 (1.658)	-0.298 (1.848)
Teamwork, Management, Leadership Demands (Sector Mean)	2.558* (0.967)	1.319 (1.611)	8.482* (1.580)	-0.613 (0.922)	1.036 (2.950)	-2.599 (2.480)
Communication, Innovation, Creativity Demands (Sector Mean)	2.606* (0.893)	0.406 (1.821)	6.775* (1.491)	-0.732 (0.928)	-0.966 (3.048)	8.847* (3.033)
Mastery of Disciplinary Knowledge and Analytical Skills (Sector Mean)	3.356* (1.049)	10.710* (1.580)	3.994* (1.545)	-0.990 (1.018)	-6.046* (2.704)	-8.920* (2.731)
Public sector proportion	3.071* (1.079)	6.941* (1.750)	-0.404 (1.638)	-3.137* (0.894)	4.676 (3.011)	6.753* (2.293)
Tertiary education attainment Sector	0.040* (0.011)	0.055* (0.020)	0.052* (0.019)	-0.002 (0.010)	0.046 (0.031)	0.045 (0.036)
Tertiary education attainment Growth Sector	0.018 (0.022)	-0.090* (0.039)	0.032 (0.058)	-0.011 (0.022)	0.026 (0.089)	-0.029 (0.064)
Technological Level	0.103* (0.032)	-0.135* (0.055)	0.329* (0.040)	0.439* (0.085)	-0.098 (0.091)	0.150* (0.078)
Technological Growth	0.052 (0.046)	0.460* (0.081)	-0.375* (0.062)	-0.023 (0.148)	-0.057 (0.141)	-0.198 (0.136)
Globalisation Exposure	0.032 (0.034)	0.119* (0.054)	-0.032 (0.052)	-0.077* (0.022)	0.421* (0.094)	-0.044 (0.077)
Globalisation exposure Growth	-0.122 (0.081)	-0.252** (0.134)	0.113 (0.114)	0.083 (0.066)	-0.676* (0.199)	0.158 (0.151)
Employment Protection Index	1.029* (0.438)	1.348** (0.809)	2.937* (0.660)	0.935 (0.790)	-0.782 (1.306)	-0.863 (1.279)

* p < 0.05

** p < 0.1

Table 11 above represents the continuation of the results of the same regression model (4). It presents, however, only the main sector level effects on job quality and its five studied

dimensions (effects on the intercept). In these models, macro-level variables are entered all together as contextual effects, the occupation variable was subsequently allowed to be random at sector level, and interaction effects between sector level variables and occupational groups were included one by one (presented in the next section).

Coming first to the issue of differences in work demands in terms of skills between sectors. In the previous section on individual level effects of work demands on job quality and its dimension it was concluded that jobs in which graduates are required to demonstrate above average level of subject specific skills and soft transferable skills like communication, management or creativity are strongly associated with increased job quality in almost all of its dimensions. ICT related skills at individual level (above average use of computers and internet compared to other graduates in the same sector) are not associated with any job quality dimensions apart from higher job security indicating that such workers had more permanent positions. Translating these skills at sector level, the aim was to establish if the sectors of the economy in which on average, a specific types of skill is more required are associated with higher graduate job quality. As we can see from Table 11, higher than average use of computers and the internet in a sector of the economy is even associated with a deskilling effect. In other words it is negatively associated with skill utilisation ($\beta = -2.082$). On the other hand graduates working in sectors characterised by high utilisation of computers and internet technologies are on average slightly better paid than graduates in other economic sectors ($\beta = 1.265$). This indicates that claims derived from the skill-bias technology theory about premiums related to computer use are only partly valid (hypothesis 3). The wage premium does not exist at the individual level but at sector level, indicating that graduates working in the ICT intensive sectors have slightly better paid jobs. However, this premium is offset by an even larger penalty in terms of underutilisation of graduate skills in these sectors. Hypothesis (5) about the negative effects of use of computers on work autonomy cannot be supported, as there were no significant

correlations either at individual or at sector level, between this dimension of job quality and the use of computers and the internet at work.

With regard to other types of skills, the sectors which demand more teamwork, managerial and leadership skills are characterised by substantially higher work autonomy ($\beta = 8.482$). One standard deviation increase in the average work requirement in a sector for teamwork, management and leadership skills was associated with an 8.482 (on the scale 1 to 100) increase in work autonomy for graduates. Similarly, sectors with higher demands for communication, innovation and creativity skills are associated with higher work autonomy for their graduate workers ($\beta = 6.775$), but also with better work-life balance ($\beta = 8.847$). Not surprisingly, sectors with a high demand for disciplinary knowledge and analytical skills (work in higher education sector being a prominent example), are characterised by better graduate jobs in terms of high skill-utilisation ($\beta = 10.710$), work autonomy ($\beta = 3.994$). On the other hand, higher sectorial demands for these kinds of skills are also associated with lower job security ($\beta = -6,046$) and worse work work-life balance ($\beta = -8.920$). Highly skilled graduate jobs are evidently becoming more insecure. Correlations not mentioned between graduate job quality dimensions and sector means for different skill demands at work were not statistically significant. These findings, generally speaking, support the hypothesis about unobserved skills, which are transferable and soft in nature, and which bring premiums in terms of job quality, not in the segment of income but rather in terms of skill-utilisation and work autonomy.

Differences in many aspects of job quality are found between employees working in public and private sectors of economy (Gallie, 2008; Stier, 2015), however in the case of sectors of economic activity as analysed here one should take into account that parts of the sectors might be public and parts private (e.g. schools, universities, health sector etc.). The higher public nature of a particular sector of economic activity in terms of the proportion of graduates employed in public institutions or companies is positively correlated with skill utilisation ($\beta =$

6.941) and negatively with income ($\beta = -3.137$). In other words and not surprisingly, graduates working in the public sector (mostly teachers, doctors, civil servants etc.) are using more of the skills that they obtained in education, but are less paid than graduates working in the private sector.

Concerning the major theoretical assumptions of educational institutionalism, technology, globalisation or regulative framework, the findings provide only partial support for the related hypotheses.

Firstly, the expectation concerning the transformative nature of education claimed by the educational institutionalism hypothesis seemed to be supported (hypothesis 9) by the statistically significant, yet relatively small in effect, positive correlation between skill utilisation ($\beta = 0.052$) and work autonomy ($\beta = 0.052$) and the proportion of workers with higher education degrees in the sector. Higher educational attainment in a sector was associated with slightly higher skill utilisation and work autonomy for every graduate worker regardless of the occupational group he or she belonged to, but had no association with income. As expected, the rate of growth in tertiary educational attainment across sectors of the economy has an offsetting negative effect in terms of skill utilisation ($\beta = -0.090$), which was theorised to be short term in nature as the occupational system adjusts to this new type of workers (hypothesis 11). Nevertheless, this finding indicates that rapid growth in the number of workers with higher education degrees in sectors of the economy can offset the generally positive impact of tertiary educational attainment on skill utilisation as many graduates end up in (at least initially) less demanding jobs. On the other hand, the rapid increases in the proportion of workers with higher education does not offset the generally positive impact of higher tertiary education attainment in a sector on increased work autonomy. Levels of work autonomy in the sectors increase with the increase in the proportion of a highly educated labour force in the sectors, as graduate workers seem to be able to organise and do their work more autonomously

regardless of their occupational placement. The general increase in the proportion of highly educated workers in the sectors and the overall tertiary education attainment in the sectors, however, did not have any significant association with pay increases or decreases for graduates, nor with job security or work-life balance.

Turning to the technological level, the general expectation based on the theory of skill-bias technology was that technological level and technological growth would be associated with a higher level of job quality of graduates as highly skilled workers, on all measures (hypothesis 1). The findings provided only partial support for these expectations. First, as expected, a high level of technological development seems to benefit graduate workers in terms of work autonomy ($\beta = 0.329$), income ($\beta = 0.439$) and work-life balance ($\beta = 0.150$). Here, one should have in mind the high level of correlation between the technological level and general state of economical development of countries (GDP PPP per capita), which probably explains the link with higher income levels or better funded child care arrangements. A surprising finding is that a high level of technological development in a country²¹ is negatively associated with job security ($\beta = -0.098$) and skill utilisation ($\beta = -0.135$) in graduate jobs. Apparently, some graduate skills in countries with high technological development remain underutilised and jobs for graduates are more insecure. One assumption would be that higher education graduates possess a different set of skills based on their education that are not utilised enough in their increasingly technology dominated and more insecure workplaces.

Above and beyond the level of technology, skill-bias theory seems to have support in the sense that technological growth (not level) was positively associated with skill utilisation ($\beta = 0.460$) providing evidence for the theoretical assertion that rapid technological development in a country requires an ever higher level of skills and increased numbers of

²¹ ArCo index of technological development is country based and it is used in the absence of any better indicator for the technological development within individual sectors of economy. The

skilled workers (Acemoglu, 2002). The rapid positive effect of the technological growth on skill utilisation might offset the generally negative association of technological development and skills derived from education. On the other hand, rapid technological growth was negatively associated with work autonomy ($\beta = -0.375$) indicating probably that rapid technological development implies greater routinisation, work interdependency and segmentation of work tasks in graduate jobs.

Similar to technological growth and level of technological development, globalisation exposure in a sector seemed to have not so straightforwardly negative or positive effects on graduate job quality. High globalisation exposure in the sector of graduate employment was positively correlated with skill utilisation ($\beta = 0.119$) and job security for graduates ($\beta = 0.421$), while it had a negative but small effect on graduate earnings ($\beta = -0.077$). While globalisation and related increases in competition, outsourcing and off-shoring might affect low-skilled workers without higher education more negatively, highly skilled graduates in Europe did not seem to be as affected by outsourcing and off-shoring activities as their low-skilled co-workers, contradicting hypothesis 6. Nevertheless, similar to educational attainment and technological development effects, level and growth of the dimensions offset each other. Sectors in which globalisation exposure has grown more rapidly showed deskilling effects in their graduate jobs (negative association with skill utilisation ($\beta = -0.252$)), and in these sectors jobs become more insecure (job security $\beta = -0.676$). Sectors with low levels of globalisation exposure usually had higher levels of growth due to their relatively low start base, hence the negative consequences of globalisation on employed graduates (they report less skill utilisation and more job insecurity) might have been more visible, due to rapid and more visible changes in their work settings.

Finally, the effect of market regulation was not consistent across measures. High regulation was associated with higher skill utilisation ($\beta = 1.348$) and work autonomy ($\beta =$

2.937), but surprisingly not with job security or income. In the case of graduate workers employment protection measures do not seem to matter for job quality in the dimensions one would expect (income and job security). One should also have in mind that the legislative protection of workers is usually primarily designed to protect less skilled workers in more precarious jobs. However, countries with higher employment protection seem to have economic structures that benefit highly educated workers in terms of better skill utilisation and greater work autonomy.

4.4.5 Occupational random slopes and cross-level interaction with sector level factors

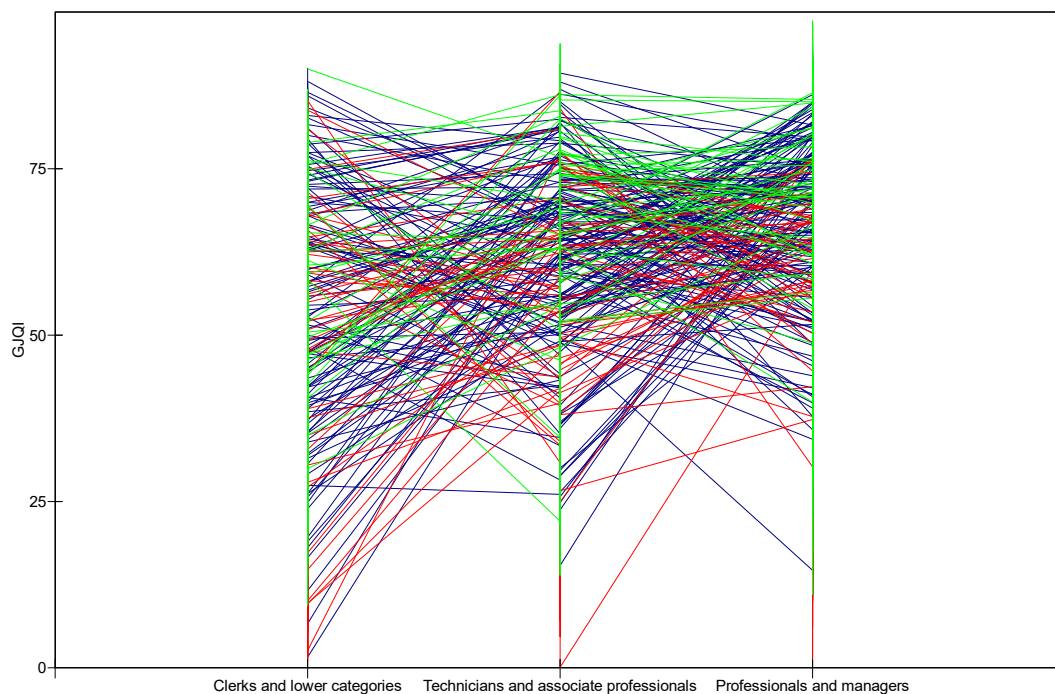
The previous section reported the main effects of the macro-level variables on graduate job quality and its dimensions (effects on the intercept). Previously presented results (coefficients in the **Table 11**) indicated outcomes for graduates working as associate professionals and technicians (the reference group of the occupation variable), while the occupation differences were fixed at the individual level (coefficients in the Table 10). Following the models described previously (5 and 6) occupational group coefficients for two non-reference groups of graduate occupations were allowed to be random at the sector level. The purpose of this modelling step is to establish if the occupational differences in graduate job quality vary across sectors of economy. In the Table 12 and Table 13 below in upper panels, indicate random slope model outcomes for graduates working as managers and professionals and those in lower occupational groups. In the lower panels of the same tables the interaction effects (effects on the slopes of these two occupational groups with sector level explanatory variables) are presented. They pertain to the potential deviation of each of the other occupational groups from the main effect (presented in Table 10 above).

Non-significant cross-level interaction therefore indicated that there the strength of the association between the level 1 (occupation) predictor and the outcome does not depend or cannot be explained by differences in the level 2 (sector) variable. Further, if the main effect is not significant, the cross-level interactions are meaningless regardless of their statistical significance (in such cases cross-level interactions were not presented and in the Tables 12 and 13 marked as not applicable).

In this way, the analysis of the occupational slopes and the interaction of sector and country level variables with these slopes, provided answers to the last two research sub-questions about occupational differences in job quality. One question asked how

occupationally underemployed workers (graduates clerks and lower occupations) fare compared to other workers on a variety of job quality dimensions, as well on the composite indicator of graduate job quality (GJQI)? The other remaining question concentrated on the conditions at sector level, under which graduates in lower than professional occupational categories have access to better employment in terms of job quality (cross-level interaction)? In other words, under which circumstances does the gap in job quality between different occupational groups narrow, and under which circumstances does it widen?

The first step in the analysis was to establish whether the relationship between the occupational placement of graduates and job quality and its dimensions varied across sectors of the economy. The random slope coefficients for both professionals and managers (Table 12) and for lower occupations (Table 13) confirmed that there are indeed differences between sectors in this relationship. In other words in some sectors the occupational gap in job quality between graduates working as professionals and those working as associate professionals and technicians is bigger and in some sectors is smaller. Similarly in some sectors of economy the differences in job quality between higher education graduates working as clerks and lower occupations and those working as associate professionals are bigger and in other sectors smaller. Figure 14 illustrates these differences between occupational groups in GJQI. As we can see, the slopes in question are in some sectors indeed much steeper than in others.

Figure 14 : Occupational differences in GJQI among graduates in different sectors

The covariance coefficients between intercepts and slopes indicated whether the differences between occupations in which graduates work differ according to the overall level of graduate job quality and its dimensions in particular sectors of the economy. As we can see from Table 12, negative and significant covariance between intercept and slopes in all job quality dimensions at the top end of the occupational continuum (between graduates working as professionals and managers and others working as associate professionals and technicians) points to the so called “fanning in” effects on the slopes. This effect implies that the higher the sector is in terms of overall job quality, skill utilisation, work autonomy, income, job security and work-life balance levels, the smaller will be the differences between these two occupational groups of graduates. So the overall level of job quality does reduce differences in job quality between professionals and associate professionals (e.g. in primary and secondary education between teachers and assistant teachers or in the health sector between nurses and doctors). The fanning in effect is not however present at the lower end of the occupational scale (between graduates working as clerks and in lower occupations and those working as associate

professionals and technicians) in the majority of job quality dimensions. The only exception is income. The pay gap between graduates working in different occupational groups is much smaller in the high ranked job quality sectors (sectors coloured green), like education sectors, in the majority of countries than in the low ranked job quality sectors (sectors coloured red), like wholesale and retail trade, in many countries.

Coming back to the significant deviations from the main associations between sector level characteristics in job quality and its dimensions described in the previous section, one can notice the following statistically significant effects on occupational gaps in graduate job quality:

First, high demands for disciplinary knowledge and analytical skills as well a high demand for communication, innovation and creativity skills within a sector of the economy showed significant correlations with occupational slopes on income (professionals and managers slope, $\beta = -1.620$ for communication, innovation and creativity demanding sectors, and $\beta = -2.192$ for mastery of discipline and analytical skills demanding sectors). However the main effect of the prominence of these skills in particular economic sectors on graduates' income was not significant, so these slope coefficients can be ignored.

Second, hypothesis 11, that tertiary educational attainment in the labour force in a particular sector of the economy is positively associated with smaller gaps in job quality between graduates in different occupational groups does not seem to be confirmed. Although graduates in sectors with high tertiary educational attainment benefit in terms of higher skill utilisation and work autonomy in the main effect for all occupational groups, this variable was not associated with significant decreases or increases in occupational gap in these dimensions.

Third, the most interesting finding was the impact of technological growth on skill in the line of polarisation hypothesis concerning the impact of technology (Goos et al., 2009). The analysis of main effects in the previous section showed a positive correlation between

technological level and work autonomy, income and work-life balance as the main effects, and a surprising negative correlation between the overall level of technological development and skill utilisation for highly educated workers (the deskilling of professional work). Hypothesis 2, that technological development and technological growth are having a polarising effect, and are widening the gap in job quality between graduates employed as managers and professionals and those in lower occupational categories does not seem to be valid in the case of higher education graduates. In fact it seems that partly the opposite is true. In terms of skill utilisation the effect seems to be in the opposite direction in the case of differences between a) professionals and managers and b) associate professionals and technicians. The gap in skill utilisation between these two occupational groups actually widened with an increase in the level of technology as professionals and managers seemed to suffer more from the general deskilling effect of technology on professional work than the middle occupational group of associate professionals and technicians ($\beta = -0.121$, $p < 0.1$). On the other hand, the general positive effect of technology level in a country on pay levels seemed to benefit more the highest occupational group in comparison with the middle occupational categories ($\beta = 0.069$). In other words, high technological level and rapid technological development in particular countries were associated with a higher pay gap between professionals and managers and associate professionals and technicians.

Finally, high globalisation exposure and growth in employment sectors seem to have more impact on graduates employed as clerks and other lower occupations. In such circumstances, the gap between them and the higher occupational categories widened in terms of skill utilisation (clerks and lower occupations slope, $\beta = 1.176$ for globalisation expansion growth, and $\beta = 0.352$ for globalisation exposure level). In this sense, hypothesis 7 seems to find empirical support. In sectors highly exposed to globalisation tendencies (e.g.

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manufacturing or communications) graduates who end up working in lower occupational categories are far more severely penalised and report a far greater lack of skill utilisation.

Table 12: Professionals and managers – random slope model results and cross-level interactions with sector level variables

	GJQI100	Skill utilisation	Autonomy	Income***
Professionals and managers slope				
Intercept	23.106* (4.013)	71.189* (11.781)	46.028* (4.013)	8.172* (2.796)
Covariance between intercepts and slopes	-18.694* (3.287)	-60.114* (10.969)	-38.536* (3.287)	-7.272* (3.232)
Slope coefficient	19.703* (3.190)	62.235* (11.292)	45.143* (3.190)	13.053* (3.886)
Chi Square	339.987	377.514	379.623	503.695
Cross-level Interactions				
Computer Use (Sector Mean)	-0.797 (0.815)	1.408 (1.580)	0.720 (1.240)	-0.742 (0.540)
Teamwork, Management, Leadership Demands (Sector Mean)	-1.372 (1.412)	N.A.	0.732 (3.290)	N.A.
Communication, Innovation, Creativity Demands (Sector Mean)	-2.165 (1.353)	N.A.	-1.015 (2.885)	N.A.
Mastery of Disciplinary Knowledge and Analytical Skills (Sector Mean)	-0.252 (1.526)	-0.660 (2.335)	-0.492 (2.288)	N.A.
Public sector proportion	-0.799 (1.497)	0.226 (2.877)	N.A.	0.382 (0.780)
Tertiary education attainment Sector	-0.022 (0.018)	-0.018 (0.037)	-0.009 (0.032)	N.A.
Tertiary education attainment Growth Sector	N.A.	-0.059 (0.079)	N.A.	N.A.
Technological Level	-0.040 (0.044)	-0.121** (0.074)	0.034 (0.068)	0.069* (0.030)
Technological Growth	N.A.	-0.050 (0.123)	0.044 (0.116)	N.A.
Globalisation Exposure	N.A.	-0.110 (0.122)	N.A.	-0.045 (0.051)
Globalisation exposure Growth	N.A.	-0.117 (0.296)	N.A.	N.A.
Employment Protection Index	-0.081 (0.738)	2.051 (1.331)	-1.696 (1.384)	N.A.

* p < 0.05

** p < 0.1

*** Random slope for income significant only at the level of sector of economy but not on the level of country of employment
N.A. = Non applicable because the main effect is not significant.

Table 13: Clerks and lower occupations – random slope model results and cross-level interactions with sector level variables

	GJQI100	Skill utilisation	Autonomy	Income***
<i>Clerks and lower occupations</i>				
Intercept	5.504* (0.764)	15.347* (2.402)	14.078* (2.085)	5.328* (0.787)
Covariance between intercepts and slopes	2.426 (2.267)	-4.821 (5.958)	-0.676 (5.011)	-4.205* (1.377)
Random slope coefficient	47.960* (9.810)	158.512* (26.468)	131.183* (32.172)	20.836* (10.114)
Chi Square	550.170	622.165	652.854	427.591
<i>Interactions</i>				
Computer Use (Sector Mean)	-1.418 (2.045)	-5.484 (3.756)	N.A.	1.673 (1.421)
Teamwork, Management, Leadership Demands (Sector Mean)	1.572 (3.480)	N.A.	-0.327 (7.927)	N.A.
Communication, Innovation, Creativity Demands (Sector Mean)	0.606 (3.554)	N.A.	3.159 (7.166)	N.A.
Mastery of Disciplinary Knowledge and Analytical Skills (Sector Mean)	0.401 (3.799)	4.195 (5.865)	-1.028 (6.334)	N.A.
Public sector proportion	0.904 (3.464)	5.589 (6.592)	N.A.	1.691 (1.766)
Tertiary education attainment Sector	-0.021 (0.048)	0.047 (0.101)	-0.008 (0.096)	N.A.
Tertiary education attainment Growth Sector	N.A.	0.036 (0.215)	N.A.	N.A.
Technological Level	0.065 (0.085)	0.270 (0.176)	0.068 (0.147)	-0.057 (0.047)
Technological Growth	N.A.	0.177 (0.176)	0.462* (0.147)	N.A.
Globalisation Exposure	N.A.	0.352** (0.205)	N.A.	0.036 (0.071)
Globalisation exposure Growth	N.A.	1.176* (0.582)	N.A.	N.A.
Employment Protection Index	-0.273 (1.244)	-4.632 (3.406)	1.132 (2.860)	N.A.

* p < 0.05

** p < 0.1

*** Random slope for income significant only at the level of sector of economy but not on the level of country of employment

4.5 Summary of findings

The volume and complexity of findings presented can be summarised in terms of effects on the individual dimensions of job quality, and then according to the main guiding theoretical approaches from which the individual hypotheses were derived (skill-bias theory, new institutionalism or theory of global knowledge capitalism).

4.5.1 Skill utilisation

Firstly, with regard to the issue of *skill utilisation*, the strongest contributor to overall job quality in the case of higher education graduates, the findings suggest that:

- A) Skill utilisation is primarily seen by graduates in Europe as the extent to which disciplinary knowledge and analytical skills are demanded at work. Softer skills and abilities come only in second place. At the individual level (in comparison with other graduates in the same sector) jobs at which graduates indicated they used their skills most are unsurprisingly, those which demand a high level of disciplinary expertise and analytical skills, followed by jobs which demand communication, innovation and creativity and then by jobs which demand teamwork, management and leadership skills. On the other hand, jobs which demand higher than sectorial average levels of use of computers and the internet bring no premiums in terms of skill utilisation, contradicting some assumptions of skill bias technology theory (Lauder et al., 2016).
- B) The contextual sector level conditions matter significantly when it comes to graduate skill utilisation. Following the previous conclusion, that graduates relate the question of skill utilisation mostly to mastery of disciplinary specific knowledge and analytical skills, it is not surprising to find that the skills they gain from education are utilised more when they work in the public sector (as teachers, doctors, lawyers) or in other highly knowledge intensive sectors.

- C) Technology seems to have a more deskilling than upskilling effect on professional workers. Following the findings on deskilling individual effects related to computer and internet use at work, the sectors in which graduate work involves intensive use of computers and the internet have a negative effect on skill utilisation. These findings are not inconsistent with expectations of the theory that the routinisation that comes with computer technologies has a deskilling effect in the case of knowledge workers (Brown et al., 2012). Contrary to the expectations of the skill-bias technology theory (Acemoglu, 2002), the deskilling effect of technology on professional workers is evident in the negative association between technological development level in a country and skill utilisation. This negative relation affects even more professionals than associate professionals and technicians, as the analysis of occupational slopes confirms, while there is no difference in the deskilling effect between associate professionals and lower occupations. Polarisation effects due to technology, analysed only within the highly educated segment of the labour force are partly in the opposite direction confirming other researchers' findings (Stier, 2015) and contesting the usual polarisation claims (Goos et al., 2009). It might be that high levels of technology in a country demand more skill from highly skilled workers, however that must then be some other type of skill and not the education-based skill that is assumed by the majority of theorists and researchers.
- D) Globalisation exposure, after controlling for all other sector level variables has a positive effect on graduate skill utilization. This is not inconsistent with the expectations of the skill biased technology theory (C. Goldin & Katz, 2007). One possible explanation of this effect is that sectors with the highest globalisation exposure do create relatively more skill demanding jobs for highly educated graduates, while

there are probably more negative effects on the jobs of medium and low skilled workers, whose work is more prone to be offshored or outsourced.

- E) More educated employment sectors (higher tertiary educational attainment in the labour force) understandably tend to be places in which graduates use their skills and abilities more. This highly educated working environment benefits graduates irrespective of their occupational position. In fact the skill utilisation differences between the top two groups of graduate occupations (between professionals and managers on the one hand, and associate professionals and technicians on the other) become smaller with the overall level of skill utilisation in these sectors of the economy. All these factors provide evidence in support of the educational institutionalism theory, which makes claims for the transformative nature of education in work settings (D. Baker, 2014).
- F) Finally, the impact of labour market regulation has a positive relationship to graduate skill utilisation. This speaks in support of the hypothesis that more coordinated market systems do tend to create better working conditions for highly skilled persons once they find employment, due to their stronger in job training features (Gallie, 2008).

4.5.2 Work autonomy

With regard to the second strongest contributor to the overall job quality – **work autonomy**, the findings suggest that:

- A) At the individual level (in comparison with other graduates in the same sector) jobs in which graduates indicated they enjoyed most work autonomy are unsurprisingly those which demand a high level of communication and innovation, followed by jobs which demand a lot of disciplinary expertise and analytical skills, and lastly by jobs which demand teamwork, management and leadership skills. On the other hand, jobs which demand higher than sectorial average levels of use of computers do not have a

significant negative or positive impact on the work autonomy of graduate workers, contrary to some claims (Brown et al., 2012).

- B) At the sectorial level, higher levels of work autonomy are to be found in the sectors which have a strong demand for teamwork, management and leadership skills, followed by those which demand high levels of communication, innovation, and creativity skills, and finally in those with stronger demand for disciplinary expertise and analytical skills. Similar to the findings from the individual level, higher sectorial demand for the use of computers and the internet has neither a significant negative nor a significant positive impact on the work autonomy of graduate workers in that sector, contradicting the usual routinisation and segmentation thesis about ICT and professional workers (Brown et al., 2012).
- C) High levels of technological development in a country and high levels of tertiary educational attainment in the sectors of employment have positive effects on work autonomy, speaking in support of the educational institutionalism thesis and skill-bias technology theory which in general assumes better working conditions including higher work autonomy for highly skilled workers.
- D) Globalisation exposure has no significant effects on the work autonomy of highly educated workers, contradicting some theoretical claims (Brown et al., 2012)
- E) Occupational differences in work autonomy do not increase or decrease, but remain stable with increases in tertiary education, globalisation exposure or technology. On the other hand, differences between the work autonomy of professionals and managers and associate professionals and technicians tend to be smaller in sectors with higher work autonomy in general.
- F) Finally, labour market regulation has a positive relationship with graduate work autonomy. This speaks in the support of the hypothesis that, in general, more

coordinated market systems tend to create better working conditions for highly skilled persons, once they find employment, due to their stronger in job training features (Gallie, 2008). Although it has no direct relationship with work autonomy, employment protection seems to have beneficial effects in general, as more coordinated market economies have structures that in other respects create more autonomy for highly educated workers.

4.5.3 Income level and pay gap

Income has been often studied as the only parameter of job quality (Appelbaum et al., 2003; Krueger, 1993). In the case of graduate pay, the findings of this multilevel analysis partly confirm and partly contest theoretical assumptions:

- A) Wage premiums for graduates at the individual level are associated with disciplinary knowledge and soft skills and not with use of ICT. Jobs in the same sector which have a higher than average demand for communication, innovation and creativity skills tend to command the highest wage premiums, followed by jobs with high demands for disciplinary expertise and teamwork, management and leadership skills. This largely contradicts the computer use wage premium theory which dominates skill-bias technology research (C. D. Goldin and Katz, 2009; Krueger, 1993). At the individual job level such wage premiums simply do not exist.
- B) In contrast to the findings from the individual level, work in ICT demanding sectors brings wage premiums, while higher demand for other skills has no significant impact on graduate income. Work in the public sector, as expected, is associated with lower pay. The ICT related wage premiums are therefore sector and not individual job related, as the sector in which ICT is more used are probably private, more productive and which for various reasons can afford to pay higher wages to their highly educated workers.

- C) Graduate income levels largely depend on the country of employment and not on the type of jobs or sector of employment (33% of variance is at the country level), even after controlling income for purchasing power parities. The technology development level in a country is positively correlated with income variables, and explains the majority of income variance at the country level. This is due to its high correlation with the general economic development level (GDP per capita). Graduate workers in richer countries, which also tend to be more technologically advanced, are simply paid better than their counterparts in other less developed countries regardless of the sector of employment or type of jobs. In more technologically advanced countries there are wider differences in pay between managers and professionals and associate professionals and technicians.
- D) The pay gap between graduates employed in different occupations tend to decrease with the overall pay level in a sector of employment.
- E) Tertiary education attainment levels and their growth show no significant relationship with graduates' income levels. Education level might have a transformative effect on the skill content of the jobs graduates do, and on their work autonomy, however it does not have any visible effect on pay structures.
- F) Globalisation exposure in the sector has a small but statistically significant negative impact on wages for all graduate workers. This is not inconsistent with the general assumptions about the negative effects of globalisation (Oesch, 2013). There are, however, occupational differences in this effect. In sectors highly exposed to globalisation tendencies (e.g. manufacturing or communications), graduates who ended up working in lower occupational categories are far more severely penalised in terms of wages, thus partly supporting the polarisation hypothesis (Goos et al., 2009; Oesch, 2013).

4.5.4 Job security

The following findings can be summarised for the job security dimension of overall graduate job quality.

- A) There are no significant differences in terms of job security between graduates employed in different occupational categories. This indicates that the potential macro level factors do affect graduate workers irrespective of their occupational placement.
- B) Job security at the individual level is associated with structures of power at the workplace related to higher demand for coordination, management and leadership skills and high demand for computer use.
- C) At sector level, job security is negatively related with high knowledge intensity in a sector (a strong negative relationship between high demand for disciplinary knowledge and analytical skills and job security). Knowledge intensive sectors like R&D, higher education or consultancy work in most countries, offer high levels of skill utilisation and work autonomy, but do tend to be very insecure.
- D) Technological level and employment protection arrangements in a country, and tertiary education attainment in a sector do not have any significant association with graduate job security.
- E) Globalisation exposure growth is, as expected, related to a reduction in graduate job security.

4.5.5 Work-life balance

Often neglected, this last dimension of graduate job quality shows some interesting findings:

- A) There are no significant differences in terms of work-life balance between graduates employed in different occupational categories.

- B) At the individual level, work-life balance tends to be worse in jobs in supervisory roles, or those that demand higher than sector average use of communication, management and leadership skills. On the other hand, jobs that require more than average use of communication, innovation and creativity skills and more use of disciplinary knowledge and analytical skills tend to provide for better work-life balance.
- C) Graduates working in the public sector and sectors demanding high levels of communication, innovation and creativity skills do get a premium in terms of better work-life balance. On the other hand, graduate jobs in highly professional and knowledge intensive sectors with high demand for disciplinary knowledge and analytical skills are characterised by a lack of work-life balance.
- D) Graduates working in the more technologically developed (also richer) countries tend to have a better work-life balance. This positive correlation is probably due to other unobserved factors like better welfare and childcare provision.
- E) Globalisation exposure and employment protection arrangements in the country, tertiary education attainment in the sector do not have any significant associations with work-life balance.

5 Conclusions and discussion

The expansion of higher education in Europe led, inevitably, to an enlarged graduate labour force in almost all countries and almost all sectors of economic activity. Within this general trend, and drawn from the simple statistical overviews based on the occupations of graduate workers discussed in the introduction, two patterns appear. First it appears that a professionalization phenomenon is occurring in at least some segments of the labour force, as the general share of occupations considered high skilled (professionals and managers) is growing in all analysed European countries and in many but not all sectors of economy. The second pattern is the well-documented phenomenon described as occupational filtering (Holmes and Mayhew, 2015) or vertical substitution (Teichler and Kehm, 1995) within the occupational hierarchy. Namely, unable to find jobs in higher occupational categories, many recent graduates find themselves further down the occupational hierarchy. Visible professionalisation patterns have made some policy makers and researchers declare the emergence of a knowledge society and economy in the context of a new information technology revolution, which demands more highly educated workers. On the other hand, focus on the vertical substitution of non-graduates with graduates down the occupational hierarchy has made some claim that over-education explains the current situation. Both explanations imply the simplistic logic that economic demand and education supply are sometimes mismatched. This simple picture obscures many subtle but crucial processes. For instance, we noted that some have observed the nature of so called knowledge work is changing in many occupations in terms of skill requirements and increased routinisation (Brown et al., 2012, 2008). Moreover, some graduates find themselves in jobs that poorly paid or that are less secure due to the deregulation of labour markets and the pressures of globalisation. These trends do not necessarily have to be negative. There are graduate jobs that offer the potential for high skill utilisation and good wages but which are insecure; or which have relatively low wages but are

excellent in other aspects (primary and secondary education teachers); or that are both highly skilled and well paid yet do not provide work-life balance. In other words, the debate is increasingly moving away from a fascination with the growing quantity of graduate jobs to issues concerning the quality of these jobs. This brings us back to the fundamental problem addressed by this thesis, which has puzzled many researchers and policy makers, of whether more graduate jobs also implies better graduate jobs, and why there are differences in job quality? In other words, why are some sectors and countries able to provide better jobs for their graduate workers, while for others, job quality (in terms of wages and skill utilisation) is deteriorating?

To answer these questions, we asked, first of all:

1) What constitutes graduate job quality and what is the best way to measure it?

The thesis discusses different conceptual approaches to the problem of job quality, which may focus only on wages or job satisfaction or skill requirements, and proposes a more nuanced concept of job quality based on Francis Green's (2006) operationalisation of the functioning-capabilities philosophy of Amartya Sen and Martha Nussbaum (Nussbaum, 2011; Sen, 1993, 1999) in the context of work and job quality. A good graduate job is seen to have the characteristics of jobs that allow individuals to realise their central human capabilities in the domain of work and indirectly in life, namely: 1) skill utilisation – enabled to use their thought, knowledge and skills to do meaningful work; 2) work autonomy - control of own work environment with discretion to determine the content, method and pace of work; 3) income - to earn enough to allow the acquisition of sufficient material resources for a healthy and lengthy life and control of own material environment (provision of a home, for example; 4) job security – the capability to plan own life; 5) work-life balance – the capability to emotionally attach to others, reproduce, play and affiliate in society (work-life balance).

On the issue of the measurement of job quality, this thesis proposed the use of a composite index of graduate job quality, due to the simplicity of its potential application in policy contexts. However, it follows the approach made by Muñoz de Bustillo and José Ignacio Antón (2011) that for the sake of clearer interpretation of the effects on job quality, the individual dimensions of the composite indices of job quality should also be reported. The thesis developed an international multidimensional index of graduate job quality through a re-analysis of existing analytical and weighting methods in the job quality literature. The proposed index uses hedonic weighting based on regressing key dimensions of job quality and job satisfaction, and controls for individual expectation-reality gaps for each of the job dimensions as well as for country differences and gender. The resulting Graduate Job Quality Index (GJQI) attributes the highest value to dimensions of skill utilisation (40.65%) and work autonomy (24.19%), followed by income (14.91%), work-life balance (11.39%) and job security (8.86%). The index was tested for stability and content validity and analysis indicated that is a good predictor of high employee turnover intentions (graduates actively seeking other jobs), indicating that it has possible predictive policy applications for purposes of job design and the reduction of staff turnover.

A finding of this methodological analysis was that the professional relevance of jobs, as well as work autonomy, are the most important job quality dimensions for evaluating their overall quality. Income is far less important, especially when one controls for the aspiration-reality gap concerning career status and income. The relative dominance of so called professional over economic dimensions of graduate jobs supports other authors' findings (Bocuzzo and Gianecchini, 2014) that strongly suggest the importance of avoiding the use of wage levels or median wages alone, as indicators of graduate job quality in various countries and sectors, or to analyse issues of occupational change. Graduates associate the highest level of job satisfaction with being able to use their knowledge, abilities and skills, and when they

have discretion in the work they do. They place far less importance on how well that work is paid, how secure it is, or how much it allows for a good work life balance. In political and policy terms this is a significant finding.

After developing adequate measures of graduate job quality, the research focused on explaining variance in graduate job quality, using a comparative perspective to explain the unequal distribution (inequality) of quality in the jobs done by graduates in different occupations, and between different sectors of the economy. This was achieved by using multilevel regression modelling, of which the main methodological advantage is that it can distinguish between and partition variance in job quality, both at a macro level (in this case sector of the economy) and variance at the level of individual graduate jobs (within different sectors of the economy). The choice of method was significant as it revealed some important findings relevant for comparative research on job quality in general.

The findings point to one fact, neglected in mostly cross-country comparison-focused comparative research on job quality, which is that differences between countries in terms of job quality are not significant on any dimension apart from income, at least not in the case of the graduate worker segment of the labour force. With income level, the country of employment matters much more than for instance the sector of employment in which graduates work or the type of job they do. The differences in the macro level are however significant, and in some cases substantial, at the level of sectors of the economy, and these should be considered more in comparative studies. Only by taking into account sector features can one understand why, for instance, the primary and secondary education sectors across Europe provide the best graduate jobs, and the sectors of wholesale and retail or transport and communications the worst graduate jobs. A multilevel perspective on graduate job quality also reveals the important point that sectoral comparisons have limits, as most variance in graduate job quality is located at individual level (e.g. there is greater difference between individual graduate jobs within one

sector of the economy than between graduate jobs in different sectors of the economy in Europe).

The research focused on contextual sector level factors that explain variance in job quality, hence the second main research question:

2) To what extent do differences in a) adoption of new computer technologies, b) exposure to globalisation and c) high educational attainment in the labour force across different sectors of the economy explain the differences in graduate job quality in general and between graduates in different occupational groups in particular?

Before discussing the findings in the light of two contrasting theoretical accounts that seek to explain the impact of technology, globalisation and education expansion, it is crucial to provide answers to the three sub questions which follow this main question.

2.1 What are the individual and contextual (sector and country level factors) which are associated with graduate job quality and its dimensions?

The research assessed associations between 12 individual explanatory variables and 12 contextual explanatory variables in the job quality index and its five dimensions. Chapter 4, presents and discusses most of these findings in detail. Here the key findings with regard to variables related to the main theoretical framework and the main research question asks: how: a) adoption of new computer technologies, b) globalisation exposure and c) high educational attainment in the labour force across sectors of economy, explain the differences in graduate job quality in general.

Use of computer technologies at work: There are differences here at both the individual and sectoral level. Above average use of computers and the internet compared to other graduates in the same sector was not associated with any premium or penalty in terms of job quality in any of its dimensions apart from job security, where it brings some rewards, and is indicative of a more permanent position. On the other hand, graduates working in sectors characterised

by high utilisation of computers and internet technologies are on average slightly better paid than graduates in other economic sectors ($\beta = 1.265$). But higher than average use of computers and the internet in a sector of the economy, contrary to the theoretical assumptions of skill-bias technology theory, is associated with lower than average skill utilisation ($\beta = -2.082$), which potentially indicates a deskilling effect of high computer use in a sector. Such sectors apparently do not provide jobs in which graduates can use the skills acquired through higher education. Here, an important finding with regard to the issue of skills and skill utilisation should be reiterated. This study shows that graduates in Europe primarily associate skill utilisation with the extent to which their work calls on their disciplinary knowledge and analytical skills. Softer skills and abilities come only in second place. One should assume that work in sectors that require a lot of computer and internet use provides fewer opportunities for graduates to use their disciplinary knowledge or other types of skills in comparison with sectors in which computerisation is not very pronounced (education or health).

There were no significant associations with the other three dimensions of job quality: work autonomy, job security or work life balance.

Level of technological development in the country: In the absence of suitable measures for the level of technological development in different sectors of the economy, the research used the crude country ArCo index of technological development (Archibugi and Coco, 2004) to test the potential impact of new technologies on job quality. This decision not only limits the interpretation of some findings on the sector level, but also (due to the high correlations of this index with the general wealth of a country (GDP PPP per capita)), makes it hard to distinguish the effects of potential technological development from the general state of development in a country. Turning to the impact of technological development, the general expectation (based on skill-bias theory), is that technological level and technological growth will be associated with a higher level of job quality of graduates as highly skilled workers. Notwithstanding the

limitations outlined above, the findings provide only partial support for these predictions. First, as expected, a high level of technological development in a country seems to benefit graduate workers, on average, in terms of work autonomy ($\beta = 0.329$), income ($\beta = 0.439$) and work life balance ($\beta = 0.150$). A surprising finding is that high levels of technological development in a country are negatively associated with job security ($\beta = -0.098$) and skill utilisation ($\beta = -0.135$) in graduate jobs. Apparently, some graduate skills in countries with high technological development remain underutilised and jobs for graduates are more insecure. One assumption, based on this finding, would be that higher education graduates possess a different set of skills based on their education that are underutilised in insecure workplaces increasingly dominated by technology.

The association between past technological growth rates and the final levels of job quality dimensions, hints in very crude terms, that the effects of technology on graduate job quality might actually be the opposite if it could be observed over time. Namely, technological growth (not level) is positively associated with skill utilisation ($\beta = 0.460$) and negatively associated with work autonomy ($\beta = -0.375$). The first would, of course, support the assumption made by skill-bias technology theory, and the second the knowledge capitalism assumption. The limits of the cross-sectional design of the study unfortunately do not allow observation of job quality over time, and hence cannot fully support or reject previous assumptions about trends. Nevertheless a space is opened here for further investigation in longitudinal studies.

Globalisation exposure: Similar to technological growth and level of technological development, globalisation exposure in the sector seems to have not so straightforward negative or positive effects on graduate job quality. High globalisation exposure in the sector of graduate employment is positively correlated with skill utilisation ($\beta = 0.119$) and job security ($\beta = 0.421$), while it has a small but negative effect on earnings ($\beta = -0.077$). This seems to support the view of skill-bias theorists about the impact of globalisation on high skilled

workers (Goldin and Katz, 2007). While globalisation, with a related increase in competition, outsourcing and offshoring might have a more negative effect on low-skilled workers lacking higher education, highly skilled graduates in Europe do not seem to be as affected by outsourcing and offshoring activities as their low-skilled co-workers. Nevertheless, similar to the effects of educational attainment and technological development, the level and growth of these dimensions might have contradictory effects. Sectors in which globalisation exposure grew more rapidly in the past tend to have lower levels of skill utilisation ($\beta = -0.252$), and in these sectors jobs are more insecure (job security $\beta = -0.676$). The latter findings are not inconsistent with expectations of the global knowledge capitalism theorists about the impact of globalisation on knowledge work (Brown, Lauder, & Ashton, 2012). As in the case of technological growth, these claims have limits because the cross-sectional design of the study unfortunately does not allow observation of job quality over time, and hence cannot fully support or deny previous assumptions about trends.

Tertiary education attainment of the labour force: the findings indicate a significant, yet relatively small, positive correlation between skill utilisation ($\beta = 0.052$) and work autonomy ($\beta = 0.052$) and the proportion of workers with higher education degrees in a sector. Higher educational attainment in some sectors (usually education, professional services, ICT or finance) is associated with slightly higher skill utilisation and work autonomy for every graduate worker regardless of the occupational group he or she belongs to, however it has no associations with income. This partly supports the views of new institutionalism (Baker, 2014) on the emergence of a schooled society. However, the past rate of tertiary attainment growth across sectors of the economy is negatively associated with skill utilisation ($\beta = -0.090$), which also potentially supports the arguments of new institutionalism. This negative effect is theorised as a short term effect until the occupational system adjusts to this new type of workers. Nevertheless, this finding also indicates that (hypothetically) in sectors where the proportion

of highly educated workers grows fast, skill utilisation levels might fall, due to the filtering of new graduate workers down occupational hierarchies. Again, due to the cross-sectional design of the data used in the study, such claims cannot be made with certainty. Similar to previous findings about skill utilisation, levels of work autonomy in a sector increase as the proportion of highly educated workers increases. One could assume that graduate workers seem to be able to organise and do their work more autonomously regardless of their occupational placement, again supporting new institutionalism's claims. The general increase in the proportion of highly educated workers and overall tertiary education attainment in a sector, however, does not have any significant association with graduate pay increases or decreases, nor with job security and work-life balance.

2.2 How do underemployed graduate workers fare compared to other workers on a variety of job quality dimensions?

The starting problem of this research was whether occupational grouping can be taken as a good measure of graduate job quality, and whether the increasing number of professionals and managers (professionalisation) is an indication that there are more good graduate jobs, or alternatively whether the process of occupational filtering of graduates and hence their underemployment in lower occupational categories implies increases in the number of poor graduate jobs. The analysis confirms in general terms both of these claims. The occupational hierarchy in graduate job quality in general, and skill utilisation, work autonomy and incomes in particular remains stable even after controlling for a number of individual and sector level factors. Graduate underemployment on average implies penalties in terms of skill utilisation, work autonomy and income. On the other hand differences in job security and work life balance dimensions between occupational groups were not significant. In other words, in these dimensions underemployed graduates should not expect either penalties or rewards in terms of job quality. Nevertheless, given the growing trend of graduate employment in lower than

professional occupational categories, which is usually higher than the rate of graduate employment growth for professionals and managers in many countries and sectors in Europe (as discussed in the introductory chapter) one can with confidence assume that the overall quality of graduate jobs is falling. Combined with the potentially negative effects of technological development, this does not project a picture of a knowledge society and economy.

2.3 What are the conditions, at the economic sector level, under which the gap in job quality between graduates employed in different occupational categories widens?

Finally, the research shows that the aforementioned general gap in job quality in terms of skill utilisation, work autonomy and income between graduates employed in different occupational groups does vary significantly based on sector of employment, and is much bigger in the sectors with overall low average graduate job quality. In the sectors that have generally high levels of job quality (e.g. the primary education or health sectors) this gap is smaller. This only applies to the difference in job quality between professionals and associate professionals and technicians. It does not become narrower or wider if the level of higher education attainment in the sector is high (contrary to the new institutionalism thesis), or due to different degrees of exposure to globalisation in different sectors of the economy. The most interesting finding is the impact of technological growth on skill, with respect to the polarisation hypothesis concerning the impact of technological development (Acemoglu, 2002; Goos, Manning, and Salomons, 2009). The analysis of the main effects of technological development (in a country) showed a positive correlation between technological level and work autonomy, income and work life balance as the main effects, and a surprising negative correlation between the overall level of technological development and skill utilisation for highly educated workers (deskilling of professional work). Skill-bias theory (that technological development and technological growth have polarising effects and are widening the gap in job quality between workers employed as managers and professionals and those in lower occupational categories)

does not appear to be valid in the case of graduate workers employed in different occupations. In fact it seems that in part the opposite is true. In terms of skill utilisation the effect seems to be in the opposite direction in the case of differences between a) professionals and managers and b) associate professionals and technicians. The gap in skill utilisation between these two occupational groups actually widens as the level of technological development increases, as professionals and managers seem to suffer more from the general deskilling effect of technology on professional work than the middle occupational group of associate professionals and technicians ($\beta = -0.121$, $p < 0.1$). This finding is in the direct contradiction of skill-biased technology premises and supports more global knowledge capitalism claims about the stratification of knowledge work (Brown et al., 2012). On the other hand the general positive effect of the technology level of a country on levels of pay seems to benefit the highest occupational group more, in comparison with the middle occupational categories ($\beta = 0.069$). In other words, high technological level and rapid technological development in a country are associated with a higher pay gap between professionals and managers and associate professionals and technicians.

Returning to the two opposite theoretical accounts about the relationship between technology and globalisation, work in general and graduate high skilled work in particular, the conflict theory of global knowledge capitalism (Brown et al., 2012) is better supported by the data, while many of the claims of skill bias theory have no empirical grounding based on the graduate data analysed in this study. For instance, high levels of technological development, as well as high levels of computerisation in particular sectors of the economy are associated with lower skill utilisation even if there is a premium in terms of income in these sectors for highly educated workers compared with other sectors of the economy. The prediction that differences in job quality between graduate workers employed in different occupational groups would decrease under the influence of skill-bias technology and expanding levels of education in the

labour force (claimed both by new institutionalism and skill-bias theorists) are also supported by the data. In fact, occupational inequality in graduate work seems to be stable. This indicates that the occupational filtering that apparently occurs in the graduate labour market in Europe does in fact decrease the overall levels of graduate job quality. More graduate jobs does NOT mean better graduate jobs, at least not in the majority of sectors of employment. However, expanding public sector services (health and education) seem to buck this trend and are enclaves in which many graduates find good job quality. However, the knowledge society cannot be only a vision for teachers and doctors, alternative policies have to be created to improve the working conditions of the majority of other graduate workers across different sectors of the economy.

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