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Overeducation among European University Graduates:

A Comparative Analysis of its Incidence and the Importance of Higher Education Differentation

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Abstract

The incidence of over-education is here assessed by applying some standard subjective and objective indicators and a new skill-based indicator of over-education to the national samples of eight European countries in the REFLEX survey. With the exception of Spain, the results reveal that over-education is a minor risk amongst European tertiary graduates. Yet, the contrast between the standard indicators and the skill-based indicator reveals the existence of an over-education of a moderate kind in countries with high tertiary attainment rates (Norway, Finland and Netherlands). Such a type of over-education does not come to the surface when applying the standard indicators. Our results also reveal the importance of higher education differentiation (i.e. field of study and branch of higher education) for understanding the risk of over-education. Graduates from humanistic fields, bachelor courses and vocational colleges are more exposed to over-education, though their disadvantage varies cross-nationally to a significant extent.

Keywords

Overeducation; fields of study; tertiary education; labour market performance; transition from school to work; systems of education

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1. Introduction

In the last decades, European countries have gone through a process of educational expansion, an important part of which has taken place in Higher Education (HE). Such an increase has been accompanied by a process of internal differentiation. The Bologna process has recently favoured a growing vertical differentiation (bachelor/master courses) which now complements the horizontal differentiation between fields of study and, in several countries, between universities and vocational colleges.

The process of educational expansion in HE is regarded by some as intrinsically good; even necessary, in order to meet an increasing demand for skills that would be naturally associated with the advent of 'knowledge' society. Moreover, it could be argued that it is always good to have better educated people, for instance because education exerts positive effects on active citizenship. There cannot be such a thing as an *excess* of education.

For others, though, educational expansion is nor always nor necessarily positive. Hartog (2000) suggests that 'the strong expansion of participation has outpaced the increase in the demanded levels of education' (134). According to this view, the risk of devaluation of diplomas, and therefore of social demotion of tertiary graduates, is real. Over-education has been found associated with low productivity and low job satisfaction. Moreover, if over-education exists, it could entail a waste of societal and individual resources. It could also favour an increase in social inequalities related to parental background, as we will see below.

In this work we will assess the prevalence of over-education in comparative perspective. Our contribution to the previous literature is threefold. First, we compare the incidence of over-education across eight European countries: Spain, Italy, Austria, Germany, Czech Republic, the Netherlands, Norway and Finland. This country selection is partly a forced choice, motivated by data constraints described in section 3, yet these nations it represent a wide variety of institutional arrangements of education and labor markets. So far, the lack of suitable data has largely prevented a comparative work of this kind. The literature on over-education has mainly paid attention to Anglo-Saxon countries, mostly Great Britain and the United States; less is known about continental Europe and Scandinavian countries. Our second contribution involves the importance of institutional differentiation within HE for the risk of being over-educated, a domain hardly explored so far. In particular, we want to assess the possibility that this risk is concentrated in some academic fields (e.g., humanities) and branches (e.g., bachelor courses, vocational colleges) of HE. Finally, we analyze over-education by means of multiple indicators and, in this context, we develop a new indicator of over-education that focuses on the *skill requirements* of occupations held by graduates. The performance of this indicator will be assessed relative to the performance of two more traditional indicators, based on the so-called 'statistical' and 'subjective' approaches. In the latter case, we have also developed a 'variant' of

standard subjective indicators that pays more attention to the internal differentiation of HE. The comparison between different indicators will highlight the importance of distinguishing between strong and moderate forms of over-education.

2. Theoretical framework and hypotheses

Human capital theory regards over-education as a negligible, or even deceitful, phenomenon. Over-education might conceal the lack of human capital endowments other than formal schooling, such as ability, on-the-job training or experience (Chevalier 2003). From this point of view, there would not be over-educated workers, but workers with a lack of adequate skills. Even if over-education existed in its 'true' sense, it would be just a short-term, temporary mismatch, to be naturally corrected by the market (Becker 1980).

According to human capital theory, workers would be prone to give up their jobs if they do not yield adequate returns to their skills endowments. According to job mobility theory, though, workers may wait in jobs for which they are over-educated, in order to attain the right amount of skills to get a match (Sicherman 1991). This theory is thus mostly concerned with the mechanisms of correction of over-education, either through internal promotion or job change.

These arguments are directly relevant for our work, because we will not consider here the occupational position held at labour market entry, but five years after graduation. It can be expected, then, that our respondents have had time enough to accumulate more human capital outside the school system (for instance, via job experience, internships, etc). Hence, we should anticipate a limited amount of over-education across graduates according to the above theories.

Credentialism theories lead to different predictions. Their starting point is that formal education would hardly enable employers to assess actual workers' productivity. Rather, it just enables them to evaluate the amount of further training needed for job candidates in order to optimise their marginal productivity (Thurow 1975). In other words, employers use formal education as an indicator of prospective workers' productivity, and they rank job candidates accordingly. Hence, a higher formal qualification would place individuals in the higher ranks of the job queue: this creates an incentive to study as long as possible. A credential inflation dynamics may thus be generated: over-education becomes a realistic scenario. We arrive at a similar conclusion from the perspective of the signalling model (Spence 1973), which regards education as a signal of individual traits (e.g. intelligence) prevalent before school enrolment. However, education is a signal that can be manipulated by individuals. Through more education, they would manage to signal higher ability and motivation to employers. Here again we see that there are pressures conductive to credential inflation.

Unlike economic approaches to over-education, sociological ones pay more attention to the role of both educational and labor market institutions. Educational institutions

matter, though economic theories seem tempted to forget about them. In particular, their degree of stratification and of selectivity affects considerably the supply of graduates. Highly stratified systems of education divert a greater share of students away from HE (Müller and Gangl 2004): the better match between the school system and the labour market, as exhibited by dual systems of education like the German one, makes educational pathways alternative to HE more appealing. Furthermore, a high selectivity at entry into HE related to the attendance of the pre-academic track is another aspect of stratification that may keep the number of tertiary degrees low, thereby enhancing their economic value. Indeed, among the eight countries under examination, the three highly stratified systems of Germany, Austria and the Czech Republic display particularly low tertiary attainment rates (OECD 2006) that are likely to prevent over-education. However, it may be objected that also Italy, characterized by a moderate degree of stratification, displays low tertiary attainment rates. In our view, Italy illustrates how selectivity can complement stratification, if we consider the impressive drop-out rates found in Italian universities, by far the highest ones observed in OECD countries (OECD 2006). Moreover, drop-out rates are comparatively high also in Austria, whereas in the Czech Republic low tertiary attainment rates are due also to the limited number of places available in HE- yet another form of selectivity. Hence, a mix of stratification and selectivity counteracts credential inflation pressures in these countries. This constrains severely the supply of graduates; therefore a low amount of over-education may be expected.

Tertiary attainment rates are much higher in Norway, Finland, Spain and, to some extent, in the Netherlands[1]. These countries have 'truly' moved to mass HE. However, it would be naïf to expect that a rapid expansion of diplomas mechanically translates into over-education. Much depends on the corresponding expansion of graduate employment, which varies cross-nationally to a considerable extent. Also in this respect we would regard sociological approaches emphasizing the importance of institutions as most promising. For it is clear that Scandinavian countries, as well as the Netherlands, have followed in recent decades a 'high-skill strategy' that combines high participation in HE with the active role of the welfare state as employer (Esping-Andersen 2004). Not surprisingly, these countries display the highest share of managerial and professional employment among the eight countries under study: this is driven mainly by a high share of skilled employment in the public sector, most notably in welfare state employment[2].

It remains to be seen whether these demand-side factors manage to compensate enough the comparatively high tertiary attainment rates of Norway, Finland and, to a minor extent, the Netherlands. What is clear, however, is that Spain exhibits 'Scandinavian' educational attainment rates without displaying a Scandinavian employment structure. It is thus in this country that, in our view, over-education should be a major risk.

It is at this point of our theoretical reasoning that the differentiation of HE may play a significant role. As HE expands in most European countries, its institutional traits may become increasingly salient for the explanation of over-education: fields of study and

different branches within tertiary education (bachelor vs. master courses, universities vs. vocational colleges).

As regards fields of study, from a human capital perspective, scientific and technical disciplines may provide higher levels of "productive skills" than humanistic disciplines, to the extent that their curricula emphasize more the acquisition of occupation-specific skills (Reimer et al. 2008). Credentialism theories arrive at similar prediction, though for different reasons: these fields may be more selective, thus signalling higher levels of ability and motivation. Finally, from a social closure perspective, some fields are more protected from overeducation because professional organizations and other stakeholder groups are more successful in keeping the supply of their graduates low and in regulating the demand for the corresponding occupations. Again, humanistic fields are expected to be in a less favourable position, as compared for instance to medicine, law or architecture. There is already evidence that the risk of over-education is higher in humanistic disciplines (Ortiz and Kucel 2008).

As regards branches of HE, we expect that students with a master degree have higher skill endowments than undergraduate students and thus enjoy better labour market prospects. Yet, again credentialism would say that a master degree may signal higher ability and motivation. The distinction between universities and vocational colleges is less clear-cut. Vocational colleges aim at providing more occupationally-specific and ready-to-use competencies, hence their students could be in a more favourable position, from the perspective of human capital theory. At the same time, universities may signal higher cognitive ability, to the extent that they tend to recruit students with higher previous achievement in upper secondary education. Moreover, universities may ensure a more robust background to learn new competencies and work tasks and thus lead to more favourable labour market prospects.

3. Data and methods

3.1. Data

We will use the data from the REFLEX survey, carried out in 2005 among individuals of fifteen European countries who had graduated from tertiary institutions in the year 2000[3]. This survey contains detailed and highly comparable information on fields of study and other dimensions of differentiation of HE. It also enables us to build several indicators of overeducation and to model the risk of overeducation controlling for an extensive set of variables (see below).

In spite of these advantages, a weakness of the REFLEX data is that national samples are not very large (*see* tab.2). This prevented us from carrying out some analyses that would be of interest (e.g., modelling interactions between educational fields and branches of HE). More importantly, in order to minimize the risk that our results would be biased by low statistical power, we decided to select the eight countries for which at least 1500 valid cases were available for our multivariate analyses[4].

3.2. Indicators of over-education

Over-education has been traditionally measured resorting to either objective or subjective indicators. As regards the former, the most accurate ones are, in our view, those based on 'dictionaries' of jobs, compiled by job analysts who report the different types of skills required to optimally perform each occupation. Job analysts thus declare the level of education required for this occupation. Unfortunately, this kind of indicator is not available for most countries, as massive efforts are needed to build these dictionaries, which can easily become obsolete due to occupational change.

Facing these feasibility constraints, many researchers rely on a cruder objective indicator. The assumption behind it is that a graduate is over-educated if she is employed in a job that most other job holders manage to access with lower qualifications. In particular, it is conventionally established that over-educated workers are those whose years of education are one standard deviation above the mean of schooling of incumbents in the same occupation. This so-called statistical approach simply considers the distribution of schooling within occupations. No reference is made to their skill requirements: only formal, credential requirements are given consideration. This approach can be severely biased by dynamics of credential inflation: if the number of graduates increases, employers may raise formal requirements for some occupations, even though lower qualifications would suffice to perform them optimally. Hence, according to this approach, if employers start demanding a tertiary degree for physiotherapists or insurance representatives, these may be counted as graduate jobs, therefore under-estimating over-education. Conservative as it is, this second objective indicator usually yields the lowest estimates of over-education (Groot and van de Brink 2000).

Then, the only *feasible* way to correct this *downward bias* is, in most cases, resorting to subjective indicators. Here, interviewees are either directly asked to assess the match between their job and educational attainment, or they are asked what the minimum educational requirements to hold their jobs are. These indicators have been praised because they enable to capture many specific job situations that only job holders are able to report: they deal "precisely with respondent's job, not with any kind of aggregate" (Hartog 2000:24). Unfortunately, it is not really clear what subjective indicators measure: skills requirements, formal requirements, a mix of the two, or some form of job satisfaction. If we pose a single, generic question, it is the respondent who decides for the researcher what over-education means.

Furthermore, all measurement approaches discussed so far share the limitation that they ignore the internal differentiation of HE. For instance, the distinction between bachelor and master degrees is not relevant to any of them. Hence, they underestimate over-education because they do not record a kind of moderate over-education, where an individual holds an upper-level tertiary degree (e.g. master) but she would just need a lower-level tertiary degree (e.g. bachelor). This risk may gain growing significance with the expansion of HE: graduates cannot be treated anymore as a homogeneous population.

This problem can be easily fixed with subjective indicators. In particular, we will use two distinct subjective indicators, derived from same question: "what type of education do you feel was most appropriate for your work?" For each country, there is a response category which situates the proper type of education below the tertiary level. This option clearly marks a situation of over-education, as perceived by the interviewee. However, another response option allows detecting a kind of moderate over-education, where a master (or university) graduate holds a position for which a bachelor (vocational college) degree would be sufficient. We have thus created a second, subjective indicator that takes the differentiation of HE into account.

But this still leaves unsolved the main problem of subjective indicators: it is not clear what they measure. We propose a skill-based indicator that marks an improvement in this respect. Our data source provides a battery of items where interviewees were asked to rate to what extent a set of skills are needed to perform their job. Some of these skills are learnt mainly on-the-job (e.g. "ability to negotiate effectively"), but four of them are significantly developed in HE, namely: the "mastery of a specific field", the "knowledge of other, related fields", "abstract, analytical thinking" and the "ability to rapidly acquire new knowledge". In our view, this core of in-depth knowledge and flexible information-processing skills is what differentiates graduate employment from more routine occupations that can be optimally performed without attending HE. This core is the (skill) *added value* of attending HE[5].

As shown in table 1, the Chronbach alphas for these four indicators range between 0,65 (Germany) and 0,77 (Spain). Moreover, factor analysis indicates that a one-dimensional solution fits the data well for all countries and that factor loadings are high: they are almost always comprised between 0,65 and 0,80. They are also similar across the four base indicators, though slightly higher for two of them, and across the eight countries. Hence they can be nicely summarized by an additive index to be used for cross-national comparisons. According to this index, graduates are over-educated when they hold jobs that do not require those key competencies that must be acquired in HE

Table 1: Skill-based indicator: validation análisis

	Chronbach Alpha	Factor loadings				
		'Mastery of your own field or discipline'	'Knowledge of other fields of disciplines'	'Analytical thinking'	'Ability to rapidly acquire knowdl.'	**% explained variance**
Italy	0.69	0.74	0.63	0.76	0.78	54,4
Spain	0.77	0.74	0.71	0.82	0.81	59,8
Austria	0.66	0.60	0.64	0.78	0.79	50,1
Germany	0.65	0.61	0.59	0.77	0.81	49,8
Netherlands	0.74	0.71	0.66	0.80	0.82	56,6
Finland	0.69	0.63	0.63	0.80	0.82	52,8
Norway	0.70	0.67	0.69	0.76	0.80	53,3
Czech Republic	0.67	0.62	0.68	0.78	0.77	51,1

As each of the four indicators ranges from 1 to 7, the top skill level possibly reported is 28. However, using this continuous index for our analyses would be inappropriate, since the notion of over-education refers only to the *lower tail* of the distribution of skill requirements (i.e. cases of *under*-education are not relevant). Therefore, we have established a threshold to dichotomise the index at 16, which corresponds to an average skill level of 4, i.e. the intermediate point in a scale from 1 to 7. However, we can exploit the fact that the original index is a continuous variable by dichotomizing at different thresholds, thus disentangling moderate forms of over-education from the strong ones, where skill requirements are particularly low.

Our skill-based indicator has the advantage that it takes into account the heterogeneity of jobs formally grouped within the same occupational title. It is therefore more detailed and context-specific than the 'dictionaries' of jobs approach. However, it is a subjective indicator and may thus suffer from the sources of bias of this kind of indicators[6]. At the same time, not being the result of a single, generic question, it is less arbitrary and ambiguous than standard subjective indicators, where the criteria to establish the 'proper' level of education for a job remain completely unspecified.

It should be clear from the above discussion that each measurement approach has its pros and cons. Moreover, different indicators are known to lead to different estimates of the prevalence of over-education (Groot and van de Brink 2000). Hence, there is value in using multiple indicators, and in replicating this exercise for several nations, as we will do. In our view, this multi-indicator, multi-country approach marks an improvement over previous studies, as it enhances the robustness of our findings.

We will use the subjective indicator and its variant described above, the skill-based indicator and a measure based on the statistical approach. REFLEX is a graduate survey, so by construction we have graduates in *all* occupations: the statistical

approach cannot be implemented directly. Yet, we can exploit the EULFS 2005 to apply an approximation of the statistical approach, following the proposal by Ortiz and Kucel (2008), who took the 80th percentile in the distribution of levels of education (ISCED schema) across individuals within each occupational title as a threshold to define over-education for this occupation. Of course, it could be objected that the 80th percentile threshold is arbitrary (just as the traditional one-standard deviation criterion), still it turns out that it leads to plausible results. Drawing on this method with the EULS, where only 2-digit information on Isco-88 titles is available, we have found remarkably similar results across countries: level 4 ('clerks') or below is the threshold to define over-education for graduates[7]. This seems reasonable, if we consider that the ISCO classification was designed precisely to group occupations according to their skill requirements, and that levels 1 to 3 were regarded as appropriate for graduates, whereas clerical and lower level occupations were not (Elias 1997). However, it is questionable that some occupations at Isco level 3, such as insurance representative, belong to graduate employment. As discussed above, the statistical approach may not record some moderate forms of over-education, so it produces conservative, lower-bound estimates of over-education.

3.3. Independent variables

Our core independent variables involve the two dimensions of HE differentiation discussed above: fields of study and type of tertiary institution. With regard to the first one, we use a twelve-category classification: a) teacher education; b) art, humanities; c) psychology, sociology; d) economics; e) law; f) biology; g) math, physics, chemistry; h) computing; i) engineering; l) architecture; m) nursing, social work; n) medicine, veterinary. However, with a detailed classification but small national samples, statistical power is an issue. Moreover, the most significant differences involve the divide between humanistic (categories a, b, c and m) and scientific fields (the remaining categories). Hence, for reasons of space, we will present our findings for this dichotomy and shortly comment on some more detailed results reported elsewhere (Barone and Ortiz 2010[8]).

As regards types of tertiary institution, we consider the difference between master and bachelor courses in sequential systems of HE (Spain, the Czech Republic and Norway); the other countries are all binary systems: here we differentiate between universities and vocational colleges.
Basic controls (gender, time since graduation, country of birth, parental education, marital status, number of children) were included in our models. Students' academic ability before enrolling in HE has been assessed through marks at the end of upper-secondary education and type of upper-secondary education completed.

4. Results

Table 2 shows the estimates of over-education according to different indicators. The statistical approach (first column) yields estimates below 10% for all countries but Spain. The estimates of the subjective indicator (second column) are similar or

somewhat higher, particularly for Austria and Germany, and again Spain is the outlier. In other words, these two indicators disagree to some extent as in previous research, but they lead to the same substantive conclusion: except for Spain, over-education is a minor risk in all countries under study[9]. Our skill-based indicator (third column) confirms this diagnosis for most countries, but it points to substantially higher over-education for Holland, Finland and Norway. In column 5, we recompute the skill-based indicator with a lower threshold (12 rather than 16), thus focussing on the "strongest" forms of over-education: estimates are now very low for all countries. This indicates that most individuals classified as overeducated in column 3 lie close to the threshold of 16: they are in a 'grey area' of moderate over-education. In sum, all measurement approaches agree that over-education is a serious problem only in Spain, but the skill-based indicator adds that moderate forms of over-education are not uncommon in the other three mass HE countries.

Table 2: Indicators of over-education: percentage estimates for each country

	Statistical	Subjective	Skill-based (threshold 16)	Subjective (refined)	Skill-based (threshold 12)
Italy (N=2641)	8,9	12,4	11,6	5.1	4
Spain (N=3342)	24,8	17,1	19,2	12.2	6,5
Austria (N=1478)	1,1	9,6	8,2	1.1	1,5
Germany (N=1445)	3,8	12,6	9,2	8.3	2,2
Netherlands(N=2988)	7,3	7,1	13,6	13.8	2,9
Finland (N=2105)	6,9	5,7	14,1	4.1	3,3
Norway (N=1953)	2,5	3,5	20,4	13.7	3,9
Czech Rep. (N=6003)	1,5	3,9	7,1	7	1,7

A limitation of all the above indicators is that they forget about the increasing differentiation of HE: over-education may occur also when a master (university) graduate ends up in a job that would be more appropriate for a bachelor (vocational college) graduate. An overall low level of over-education may thus conceal the demotion of graduates from the upper tracks to lower-tertiary jobs. REFLEX allows exploring this possibility, which has hardly ever been considered in previous studies. Table 2 reports the percentage of graduates from the upper branches of HE (i.e. universities or master courses) who regard their jobs as requiring a low-level tertiary degree (fourth column). Only a small minority of upper graduates is in this situation. The exception again is Spain, along with Norway and the Netherlands. This further reinforces our conclusion that, although strong forms of over-education are currently not very widespread among European graduates, in mass HE countries moderate forms of over-education are more common. Of course, the above finding is based only on the subjective approach. However, in the light of results displayed in table 2, we would not place much emphasis on the opposition between objective and subjective indicators (*see* also footnote 10), but rather between moderate and strong forms of over-education.

Moving to the multivariate analyses, we present results for the binomial logistic regressions that we ran separately for each of the three indicators of over-education. The effects of our core variables, i.e. fields of study and branch of HE, are reported in table 3[10]. The odds ratios indicate that humanistic fields expose to a higher risk of over-education. This applies both to the subjective and the skill-based indicator. Indeed, results for these two measures display a remarkable similarity and accord nicely with results of previous research. However, when it comes to the Isco-based indicator, we detect little evidence of higher over-education for humanistic fields. We know that this conservative measure records only the stronger cases of over-education, such as demotion to clerical or manual employment, while the two other measures are more sensitive to subtler forms of over-education. It is with regard to the latter, then, that field of study exhibits its highest significance.

According to the subjective indicator, humanistic fields seem to protect from over-education in Norway and in the Czech Republic. Our analyses based on the more detailed classification of fields of study, though, revealed that art and humanities in Norway expose to a higher risk of over-education, as it happens in other countries, but this effect is offset by the favourable position of teacher education and social work - a finding that fits with our previous argument about the role of welfare employment in Scandinavian countries, not the least because also in Finland these fields are in a favourable position[11]. Similarly, in the Czech Republic teacher education and the social sciences are in a favourable position.

When we turn to the labour market prospects ensured by master (university) courses relative to bachelor (vocational colleges) courses, results for the three indicators display considerable similarity. Indeed, for all of them, in all cases where we detect a significant effect, it points to a competitive advantage of universities over vocational colleges and of master courses over bachelor courses. In most cases the effect looks rather strong, and results for our two Scandinavian countries, as well as for the Netherlands, are particularly impressive in this regard. Hence, our results indicate that, over and above the influence of fields of study, a hierarchy between high and low tertiary degrees is being created as regard the risk of overeducation. However, this effect is not homogenous across countries: it is very strong in Nordic nations, but absent in Germany and Italy, where vocational colleges have expanded much less and have preserved a more selective profile.

Table 3: The risk of over-education: the influence of fields of study and tertiary branch; exponentiated coefficients (odds ratios) of logistic regression models

	Subjective		Statistical		Skill-based	
	Upper branch*	Humanistic fields	Upper branch	Humanistic fields	Upper branch	Humanistic fields
Italy	1,26	1,25*	1,40	2,39***	,75	1,33*
Spain	1,05	1,52**	1,24**	,56*	,87	1,18

Austria	,53**	2,54***	-	-	1,63	3,63***
Germany	1,24	1,09	,99	,47	,97	1,71**
Netherlands	,57*	1,56**	,45***	,80	,71**	1,63***
Finland	,32***	1,23*	,12***	,86	,72**	1,30*
Norway	,16***	,50**	,50*	,92	,50***	1,18
Czech Republic	,44***	,68*	,34***	1,69	,91	1,50**

Significance levels: * = 10% ** = 5% *** = 1%

* 'Upper branch' refers to master courses (vs. bachelor courses) in sequential systems of HE and to universities (vs. vocational colleges) in binary systems. Results for these two types of systems should not be directly compared.

For reasons of space, we do not report results on control variables, which go in the expected direction. In particular, women, students with poor achievement in upper secondary education and those from a low family background are more exposed to over-education. However, the parameters regarding social origins are generally small: in line with previous research, the direct effect of social origins is modest among more educated individuals (Breen 2004). However, in Spain we detect marked effects of family background on all indicators of over-education. Spain is the only country where over-education is a mass phenomenon among graduates, so this exception suggests that social origins may come into play even among graduates, when the risk of social demotion becomes serious[12].

5. Conclusions

It is often claimed that, because of the expansion of HE, overeducation has become a serious risk for tertiary graduates. However, our comparative assessment indicates that this risk is distributed very unevenly across European nations. In some of them, namely Germany, Austria, the Czech Republic and Italy, it has hardly materialized so far. We have argued that this is not surprising, considering that the structure of their educational systems has severely constrained the growth in the number of graduates.

In other countries like Norway, Finland and the Netherlands the expansion of HE has been more pronounced, but these nations have also been quite successful in creating a larger share of skilled employment, and their welfare states have played an important role in this regard. Graduates in these countries are preserved from strong forms of overeducation, such as demotion into clerical or manual employment. When we look at the skill content of their jobs, though, it is less rich than in the previous set of nations. These countries have thus managed to accommodate a larger number of graduates, but at the price that some of them end up in jobs with moderately poor skill requirements. If we consider that these are often protected, well-paid jobs in the public sector, this may be a fair compromise.

Finally, Spain is in our study the interesting "exception that confirms the rule": it shows that when a large educational expansion is not accompanied by a high rate of skilled employment creation, overeducation is a concrete risk, even in its strongest forms of demotion into unskilled jobs. Hence, the Spanish case challenges the view of human capital theory that over-education is a negligible, transient phenomenon. Mass overeducation is a realistic scenario, though for the moment it has materialized only in some European countries and mostly in a mild way.

Moreover, this positive picture may change rapidly in the coming years, and it could be different if we included more countries that have moved to mass HE. Great Britain is perhaps the most obvious example in this regard. Although we did not include it in our multivariate analyses, due to sample size constraints, another study using the Reflex data estimated that 36% of British graduates are overeducated in their initial job, but only 14% five years after graduation (McGuinness, Sloane 2009). Hence, we do not believe that our country selection is biased against detecting over-education (*see* Allen and van der Velden 2010). We would rather stress that most previous studies focussed on the very initial phase of labour market transition (e.g. first job), while our analysis refers to five years after graduation, when career patterns have crystallized more.

Our results also indicate that, within every country, over-education is unevenly distributed among graduates: the institutional differentiation of HE matters. We found that over-education is more widespread among graduates of humanistic fields, even when we include an extensive list of controls which was not available in previous studies. Furthermore, graduates from vocational colleges and bachelor courses are more exposed to over-education. However, this is not the case in Germany and in Italy. Moreover, in other countries where the base risk is generally low (e.g. Czech Republic, Austria), even marked relative differentials will not affect much the absolute probability of being overeducated. However, in Nordic countries, where the lower branches of HE have expanded more and moderate forms of over-education are more widespread, this internal differentiation can be more consequential.

Finally, we may mention some methodological contributions of our work. We have proposed a new, skill-based indicator of over-education. We have argued that, over and above *formal* requirements for different occupations, *skill* requirements are a key consideration when assessing the prevalence of over-education. This is because educational expansion favours the rise of credential requirements: tertiary degrees may be requested for some occupations, even though they are not really needed to perform the corresponding job tasks.

Unfortunately, the skill-based approach based on 'dictionaries' of occupations is seldom available and does not take into account intra-occupational diversity of skill requirements. Hence, researchers are faced with the alternative between the statistical approach and the standard subjective approach. However, we argued, and our results indicate, that the former tends to record only the strongest forms of over-education. Hence, the only alternative to avoid this downward bias is resorting to subjective indicators. Then, we proposed two innovations. On one side, we have used a subjective

indicator of over-education that tackles the internal differentiation of HE. Still, our main complaint with subjective indicators remains: they are too generic, as they leave completely unspecified the criteria to define over-education. Also our skill-based indicator relies on respondents' answers, but in a more detailed, structured and transparent way, which makes explicit reference to the skill requirements of occupations. Interestingly, both innovations allowed us to detect moderate forms of over-education that turn out to be quite widespread in some European nations.

Notes

[1] The Dutch educational system is often paralleled to the German system, thus neglecting a key difference: the much larger expansion of vocational colleges which recruit several students from intermediate secondary tracks in the Netherlands.

[2] According to the European Union Labor Force Survey (EULFS), among people aged 30 to 34 years, managerial and professional employment ranges between 45% and 53% in Norway, Finland and Holland, while it is below 40% in all other countries except Germany. Furthermore, employment in education, health and social work (sector "N" of the NACE classification) drives most of these cross-national differences, though of course also structural factors play a significant role: the technology-intensive, export-led Scandinavian economies may be opposed to the Spanish economy with its over-sized construction sector.

[3] Only Isced 5a graduates were sampled. Hence, post-secondary vocational training and similar courses included in category 5b were not included. Data collection was based on telephone or web-interviews. For more information on the conceptual foundations and methodology of this survey, *see* Allen, van der Velden (2010).

[4] By exploring the data of the 2005 EULFS for the same countries, we have checked that the main socio-demographic variables work well in the REFLEX country samples. The main data issue involves the Isco-88 variable for Norway, where titles below level 3 are significantly underestimated. Japan was excluded from the analyses as it is the only non-European country.

[5] Of course, one could wonder whether graduates really possess these skills. However, we are here interested in measuring over-education rather than over-skill, which refers to the skills *actually possessed* by respondents.

[6] However, for our multivariate analyses the critical issue is whether these subjective biases are differentially distributed across categories of the covariates (e.g. among respondents from different educational fields).

[7] This result does not change if we use the 75^{th} or the 85^{th} percentile as alternative thresholds.

[8] This is the working paper of this manuscript: its appendix contains the full results and provides more information on variables and modelling issues which could not be included here, due to stringent space constraints.

[9] This agreement is confirmed when we compare them by means of contingency tables: individuals classified in the same way by the two indicators are between 85% and 97% of each national sample. Estimates reported in table 2 are weighted. We have also computed the confidence intervals (adjusted by survey design) to check the statistical significance of the cross-national differences that we comment.

[10] Of course it makes no sense to run these statistical models on the second subjective indicator: we cannot include branch of HE among the covariates.

[11] In particular, the detailed results for fields of study with the subjective and the skill-based indicator show some revealing differences that go precisely in the direction expected by our arguments (Barone, Ortiz 2010, appendix). However, the incidence of over-education is between 1,5% and 3,9% in Norway and in the Czech Republic for two out of three indicators of over-education, so these multivariate results should be taken with caution, just like results for the Isco-based indicator for Austria (1,1% of over-education). Results concerning the Spanish case are discussed in more detail in Barone, Ortiz (2010).

[12] The employment rates of graduates five years after graduation are very high (above 90%), hence we do not expect that selection into employment creates serious biases. Indeed, control analyses based on Heckman selection models confirmed this expectation (results available upon request).

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Appendix

In the main text we reported the results based on a dichotomous specification of fields of study. This provides only a simplified description of the role of college majors for the risk of over-education. This simplification was due both to space constraints and to sample size constraints. As for the latter, a detailed classification entails two kinds of disadvantages. On the one hand, the sampling error of the estimates is high, which affects the statistical significance of the dummy variables corresponding to detailed fields of study. On the other hand, some of these dummy variables predict perfectly the outcome, so that they must be dropped from the models. These problems concern the smallest national samples, particularly when the distribution of the outcome variable is highly skewed (i.e. low prevalence of over-education). Hence, not surprisingly, the problem of perfect prediction occurs with some fields of study dummies for Norway in models based on the subjective indicator (plus the teacher education category in Finland). As for the skill-based indicator, which generally provides the highest estimates of over-education (*see* tab. 2 in the main text), the problem involves only the computing category for Austria.

These sample size constraints also prevented us from producing detailed results for the statistical indicator of over-education, which generally provides the lowest estimates of over-education. When the problem of perfect prediction involves specific categories of a covariate, it has minor relevance for the estimates concerning the other categories. The main issue is a loss of information concerning the dropped category, but this loss is more nominal than real. For instance, the issue of perfect prediction for computing graduates in Austria with the skill-based indicator shows precisely that these graduates face a negligible risk of being over-educated.

Tables 2 and 3 below show the full results of the statistical models with a detailed specification of fields of study, based on a 12-category classification. In table 1 we report a legend of the labels used in table 1, as well as detailed notes (e.g. reference categories) and comments concerning the measurement of the independent variables introduced in the models presented in tables 2 and 3. These technical specifications apply also to models reported in the text, which differ from those reported below only because of the less detailed specification of fields of study.

It is important to keep in mind that the parameters reported below refer to net effects. For instance, the disadvantage of female graduates with respect to the risk of over-education is even bigger in models that do not control for fields of study. Similarly, the effects of other structural variables such as parental education, country of birth and area of residence are partialled out by controlling for intervening variables that refer to educational attainment in upper secondary and tertiary education. This is not a problem, since structural variables are introduced here only as controls for our key covariates, i.e. fields of study and branch of HE.

It should also be recalled that graduates are a highly selected population of students; they survived until the highest levels of the educational system. This certainly explains the limited significance of parameters that refer to country of birth or to social origins, together with the empirical observation that the direct effects of family background are weakest among graduates, as already mentioned in the text and reported elsewhere (Breen 2004).

The detailed results for fields of study show that humanities display the most systematic disadvantage across countries. Results go always in this direction for the skill-based indicator, while for the subjective indicator we detect no difference for Germany and the Czech

Republic. Also graduates from social sciences tend to be more exposed to over-education than economics graduates (reference category), but this effect is less systematic, particularly with the subjective indicator. Interestingly, teacher education graduates do not exhibit any systematic disadvantage when we look at the subjective indicator, but the skill-based indicator suggests that the skill content of their jobs is not so rich. This revealing contrast suggests that teachers in pre-primary, primary and secondary education do not feel over-educated, though the skill content of their jobs may not be as rich as for other forms of graduate employment. In line with our arguments concerning welfare state employment, a contrast of a similar kind appears for the category of social work, nursing and physiotherapy graduates, particularly in Scandinavian countries. This suggests that the skill content of some of the so-called new professions may not be so rich, even though graduates in these occupations do not feel over-educated, probably because tertiary degrees are more and more demanded for these professions.

The parameters for branch of HE (i.e. master or university courses, as opposed to bachelor or vocational college courses) are generally very close to those reported and commented in the main text (based on models with a dichotomous specification for fields of study). Interestingly, however, the estimated values for Italy and Spain illustrate how a more detailed specification of fields of study can affect the results concerning other variables of interest. In particular, our claim that in Italy vocational colleges (*diplomi universitari*) are not more exposed to overeducation is reinforced now. Moreover, results for the Spanish case are now aligned with those for other countries, as upper-level graduates (*licenciatura* courses) are significantly less exposed to over-education.

Finally, we have also run the same models with an alternative specification of the skill-based index, based on two more base indicators, relative to the relevance of foreign language skills and computer skills for current job tasks. Results, available upon request, does not change significantly from the ones showed in the main text. However, in the light of the arguments outlined in the methodological section (section 3), we would regard the more restricted specification as more valid: the skill-based index refers to those skills that are *specifically* developed in HE, i.e. in other learning environments they would not be developed to the same extent. In particular, if we focus on the (skill) added value of attending HE, we should consider what differentiates it from upper secondary education or from alternative, shorter post-secondary options, such as a one-year vocational training course. The assumption behind the index proposed in the text is that these latter educational pathways cannot provide an in-depth mastery of a specific field, nor an overall expertise on related fields. More generally, we have argued that a core of in-depth knowledge and flexible information-processing skills is what differentiates graduate employment from lower-level jobs that can be optimally performed without a tertiary degree. It can be claimed, though, that foreign languages and computer skills are mostly learnt in learning environments other than HE (i.e. primary and secondary education, informal activities in the spare time, on-the-job learning, etc.), whereas in most fields of study in HE these skills cover a rather limited part of the curriculum.

Tab. 1: LEGEND and NOTES concerning variables in tables 2 and 3

Variable	Notes
Gender: female *(ref: male)*	
Area of residence: current area of residence *(ref: economically deprived areas)*	This variable is specified only for those countries with relevant territorial divides: Italy (Southern vs. Northern regions), Spain (Southern and North-western regions vs. other regions), Germany (East Germany vs. West Germany), Finland (South-Eastern regions vs. other regions)
Time since graduation: in months	This variable displays a very limited variability, because the REFLEX population is constituted just by graduates five years after graduation
Immigrant background: foreign country of birth *(ref: native)*	
Parental education1: parents with a primary or lower secondary degree *(ref: upper sec. degree)* **Parental education2:** parents with a tertiary degree *(ref: upper sec. degree)*	No information on parental occupation is available. For Germany, lower secondary and upper secondary degrees must be merged in a single category
Lives with partner: respondent lives with the partner *(ref: no)*	
Number of children	It is specified as a continuous variable for parsimony, but results do not change if we use it as a categorical variable
General secondary track: respondent has attended a generalpre-academic track in upper secondary education (ref. vocational track)	In most countries, a dichotomous specification is appropriate, or there are not enough cases to use a more articulated classification. The main exceptions are Italy and the Netherlands, where a three-category classification is feasible, though not much consequential for results.
Matura score: score obtained at the final examination To attain an upper secondary degree	The range of values of this variable changes from country to country, according to its scoring system at the final upper secondary examinations
HE branch: branch in Higher Education: university *(ref: vocational college)* or master *(ref: bachelor)*	Only Spain, the Czech Republic and Finland were sequential systems when REFLEX respondents enrolled.

FoS: set of dummy variables for fields of study *(ref.: economics).* In particular: education: teacher education human.: humanities (philosophy, foreign languages, etc) soc. sc.: psychology, sociology, political science law: law biology: biology math: mathematics, statistics, physics, chemistry computing: computing engin.: engineering architect.: architecture soc. work: social work, physiotherapy, nursing medicine: medicine, veterinary	This variable is based on the broad fields of the Isced classification for fields of study, with the following modifications: - we build three separate categories for social sciences, economics and law, rather than merging them into a single category. -we separate both biology and computing science from the other mathematic or scientific courses; - we separate social work and physiotherapy from medicine - we separate architecture from engineering

Table 2: SUBJECTIVE INDICATOR OF OVEREDUCATION
Detailed results: parameters estimates (odds ratios)

	IT	ESP	AU	DE	HOL	FI	NOR	CZ
Gender	1,178	1,298*	1,204	2,042**	1,236	1,208	0,865	1,430**
Area	1,085	0,921		0,811		1,038		
Time since graduation	1,016	0,995	1,028***	0,996	0,988	1,042	1,010	0,995
Immigrant background	1,648	0,486*	0,820	0,505	1,085	0,941	1,477	0,917
Parental education1	0,875	1,389*	0,787	-	1,109	0,788	1,641	0,781
Parental education2	1,010	0,685*	0,673*	1,379	0,948	0,858	1,221	0,989
Partner	1,354**	0,789**	0,511**	0,649*	0,530***	0,589**	0,793	0,993
Kids	0,991	1,630***	1,174	1,069	0,796	0,967	1,028	0,936
General track	0,495***	0,675*	0,785	0,934	0,711	1,559	0,402*	0,584***
HE branch	0,705	0,607***	0,698	1,032	0,518*	0,304***	0,135**	0,448***
FoS: education	1,098	0,921	2,031	0,840	0,637	****	0,680	0,551
FoS: human.	1,552*	2,116***	2,651***	0,820	2,619***	2,327**	1,403	0,805
FoS: soc. sc.	1,459	1,084	1,094	1,205	1,819*	0,392	1,198	0,477
FoS:law	1,336	0,975	0,508	1,042	0,308	1,469	***	0,460
FoS: biology	0,679	1,237	0,910	1,281	2,337	0,646	***	0,905
FoS: math	1,087	0,789	0,489	1,022	0,754	1,564	2,540	0,925
FoS: computing	0,854	0,418*	0,212	1,264	0,386	0,736	0,428	0,905
FoS: engin.	1,011	0,285***	0,954	0,435*	0,990	0,270**	1,590	0,845
FoS: architect	0,879	0,0257***	1,459	0,395*	0,717	0,717	***	1,423
FoS: soc. work	0,253**	0,389**	3,494	0,486	1,594	0,753	0,391*	0,858
FoS: medicine	0,671	0,329**	0,260*	0,348**	0,631	0,877	1,377	0,917
Matura score	0,986	0,721***	0,772**	0,649**	0,937	0,874	0,708	0,596**
N	2377	2984	1215	1333	2690	1816	1523	5485

Significance: * p<0.05, ** p<0.01, *** p<0.001

Table 3. SKILL-BASED INDICATOR OF OVEREDUCATION
Detailed results: parameters estimates (odds ratios)

	IT	ESP	AU	DE	HOL	FI	NOR	CZ
Gender	1,178	1,060	0,858	1,286	0,907	0,832	0,705*	0,800*
Area	0,707	1,142		0,402		0,997		
Time since graduation	0,983	0,993	0,974	1,001	0,993	1,016	0,989	1,001
Immigrant background	2,280	0,896	0,449	1,640	0,674	0,659	1,035	1,237
Parental education1	0,856	1,305**	1,202	-	0,901	1,042	0,750	1,135
Parental education2	0,953	0,986	0,888	0,970	1,031	0,891	1,070	1,029
Partner	1,015	0,824***	0,673	0,856	0,756	0,726	1,010	0,993
Kids	0,840	1,347*	1,221	1,111	0,980	0,964	1,043	0,844
General track	0,914	0,814	1,246	1,912	1,135	1,550*	1,031	1,139
HE branch	0,560**	0,621***	1,707	0,823	0,686**	0,784	0,462***	0,805
FoS: education	1,143	1,246	2,602***	2,846*	2,208***	0,589	1,387	2,037***
FoS: human.	1,718*	1,951***	3,374***	1,931	2,291***	1,423	2,355*	2,064***
FoS: soc. sc.	1,444	1,389*	2,717*	2,837*	1,704*	0,680	0,924	1,909
FoS:law	1,170	1,611*	0,598	1,084	1,111	1,002	1,144	1,093
FoS: biology	0,781	1,304	1,995	3,634*	1,408	0,591	2,181	1,008
FoS: math	1,044	1,297	0,331	1,459	0,936	0,873	0,869	1,454
FoS: computing	0,652	0,499	***	0,546	1,170	1,045	1,192	0,945
FoS: engin.	1,247	0,826	0,488	0,833	1,451	0,430***	1,513	1,273
FoS: architect	1,276	0,677	1,135	1,008	1,031	0,523	1,935	1,558*
FoS: soc. work	0,749	0,633	2,582	2,680*	1,370	1,023	1,755*	1,259
FoS: medicine	0,881	1,405	0,769	2,673*	0,768	0,875	2,162**	1,697*
Matura score	0,975*	0,908	0,802*	1,085	0,989	0,921	0,799	0,847
N	2075	2869	1118	1330	2573	1860	1608	5358

Significance: * p<0.05, ** p<0.01, *** p<0.001