Since 1994 Inter-University Consortium
ALMALAUREA
Connecting Universities, the Labour Market and Professionals

AlmaLaurea Working Papers – ISSN 2239-9453

ALMALAUREA WORKING PAPERS no. 10

September 2011

Participation, equality of opportunity and returns to tertiary education in contemporary Europe

by

Fabrizio Bernardi, Gabriele Ballarino
European University Institute
University of Milan

The **AlmaLaurea working paper series** is designed to make available to a wide readership selected works by AlmaLaurea staff or by outside, generally available in English or Italian. The series focuses on the study of the relationship between educational systems, society and economy, the quality of educational process, the demand and supply of education, the human capital accumulation, the structure and working of the labour markets, the assessment of educational policies.
Comments on this series are welcome and should be sent to pubblicazioni@almalaurea.it.

AlmaLaurea is a public consortium of Italian universities which, with the support of the Ministry of Education, meets the information needs of graduates, universities and the business community. AlmaLaurea has been set up in 1994 following an initiative of the Statistical Observatory of the University of Bologna. It supplies reliable and timely data on the effectiveness and efficiency of the higher education system to member universities' governing bodies, assessment units and committees responsible for teaching activities and career guidance.

AlmaLaurea:

- facilitates and improves the hiring of young graduates in the labour markets both at the national and international level;
- simplifies companies' search for personnel, reducing the gap between the demand for and supply of qualified labour (www.almalaurea.it/en/aziende/);
- makes available online more than 1.5 million curricula (in Italian and English) of graduates, including those with a pluriannual work experience (www.almalaurea.it/en/);
- ensures the optimization of human resources utilization through a steady updating of data on the careers of students holding a degree (www.almalaurea.it/en/lau/).

Each year AlmaLaurea plans two main conferences (www.almalaurea.it/en/informa/news) in which the results of the annual surveys on Graduates' Employment Conditions and Graduates' Profile are presented.

AlmaLaurea Inter-University Consortium | viale Masini 36 | 40126 Bologna (Italy)
Website: www.almalaurea.it | E-mail: pubblicazioni@almalaurea.it

---

International Conference on
"Human Capital and Employment in the European and Mediterranean Area"
Bologna, 10-11 March 2011

Participation, equality of opportunity and returns to tertiary education in contemporary Europe

by

Fabrizio Bernardi*, Gabriele Ballarino**

Abstract
The aim of the paper is to investigate the consequences of higher educational expansion on two goals of the educational system, that of promoting equity of educational opportunities and that of providing credentials that facilitate the matching between labour supply and demand. The first goal is typically studied by research on inequality of educational opportunities, the second by research on returns to education and credential inflation. The key idea of the paper is that educational expansion can have different and possible opposite effects on the two goals.

a. If with educational expansion equality of educational opportunities increases, while the occupational values of the titles decreases, one has a *trade-off* scenario, ie an increase in equality of educational opportunities is matched by a decline in the value of higher education in the labour market.
b. If equality of opportunities does not increase, despite expansion of higher education, and the returns of higher education degrees decline, one has then a *worst-off* scenario.
a. Finally, if with educational expansion equality of opportunities increases and there is no credential inflation, one has a *best-off* scenario

In this paper we systematically investigate these alternative scenarios. We perform the same empirical analysis on two distinct data sets in order to test the robustness of our findings. We use micro data from EU-SILC 2005 and from the four merged waves of the European Social Survey (2002- 2008) for 23 countries.

* Dept. of Social and Political Studies, European University Institute, Fiesole; e-mail: fabrizio.bernardi@eui.eu
** Dept. of Labour and Welfare Studies, University of Milan; e-mail: gabriele.ballarino@unimi.it

1. Introduction

The aim of the paper is to investigate the implications of the level of participation to tertiary education for two of the main goals of contemporary educational systems in Europe, that of promoting equity of educational opportunities and that of providing credentials that facilitate the matching between labour supply and demand (van de Werfhorst and Mijs 2010). The first goal is typically studied by research on inequality of educational outcomes (henceforth IEO), the second by research on returns to education, that is on the education-based inequality of occupational outcomes (henceforth IOO). The question of whether with increasing participation to tertiary education there is an equalization across social strata of the opportunities to get a tertiary degree, as well as the parallel issue of whether returns of tertiary degrees are lower when they are more diffused in the population, accordingly, attracted much research over the last decades (Breen and Jonsson 2005).

However, to the best of our knowledge no prior study has provided a direct and explicit attempt to link the two questions together into a large comparative study[1]. This is precisely the contribution of the present paper. Our key idea is that the level of participation to tertiary education, that we also will call its vertical stratification (see Allmendinger 1989), can have different and possible opposite effects on the two aforementioned goals of the educational system.

a. If a wider access to tertiary education is associated with equalization, i.e. with more equality of educational opportunities, but also with a decrease of the occupational values of the titles, i.e. with the inflation of credentials, one has a *trade-off* scenario: the increase in educational equality is matched by a decline in the value of higher education in the labour market.

b. If wider access does not go together with equalization, and the returns to higher education degrees declines, one has then a *worst-off* scenario.

c. Finally, if wider participation is associated with more equality of opportunities increases and there is no decline in educational returns, one has a *best-off* scenario

The aim of the paper is therefore to establish which of this scenarios best fits the current state of tertiary education in Europe. In this respect, our ambition is mainly descriptive and not explicative. At the present stage we do not address the causal mechanisms underlying IEO and returns to education, and limit ourselves at the measurement of the observed association between the two phenomena and the size of tertiary education. Still, our descriptive findings can have important policy implications. For instance, they can provide a useful contrast with respect to a benchmark recently set by the EU commission's "strategic framework for European cooperation in education and training (ET 2020), according to which the share of 30-34 year olds with tertiary educational attainment should be at least 40% by 2020.

We perform our empirical analysis by means of an identical analysis of two parallel data sets the European Social Survey and the EU-SILC, for 24 EU countries. The concomitant replication of the same analysis on two distinct data sets, independently measuring the same phenomena, is a key validation of our main findings (Firebaugh 2008).

The structure of the remaining paper is the following. In the next section we examine more in details the theoretical underpinnings and empirical evidence available of the alternative scenarios relating the level of vertical stratification in tertiary education to schooling equality and to the occupational value of school titles. In the third section we explain the research design and data and variables used in the empirical analysis. Issues of measurement errors in the two surveys are also discussed at some length. Finally, in the fourth section we present our results, while in the last section we draw our conclusions.

[1] While we were drafting this paper, we ran across a paper on Finland built around a very similar idea (Kivinen et al. 2007).

2. Inequality of educational opportunities and educational returns: theories and evidence

Despite the abundant research on IOE and IOO, both over time and in comparative perspective, it is however not easy to come up with a clear and unambiguous summary of the results of comparative research on this topics (but, among recent work, see Breen and Jonsson 2005 and Lucas 2009). There are in fact important differences in how the key variables are measured, and in the way underlying processes are conceptualized: inequality of social positions can be analyzed in terms of income, as economists of education do, or in terms of occupational class or prestige, as sociologists prefer to do; education can be measured by years of schooling completed or by title achieved, and in the latter case one has to cope with the notorious problem of harmonizing different national school design. Moreover, there are also relevant discrepancies in the way inequality is measured (in relative terms with odds ratios, or in absolute terms as differences in probabilities or in income/prestige score) that might account for contrasting results in different studies.

However, the general idea is that educational inequality is strictly associated to social inequality. The concept of educational stratification, as proposed by Allmendinger (1989) and developed by work that followed, makes this link explicit in the clearest way: the idea is that in contemporary societies, the differentiation in how much time an individual spends in the school system (vertical stratification) and in the type of institution this time is spent in (horizontal stratification) is one of the key processes governing the allocation to individuals to social positions. This paper focuses on the vertical dimension of educational stratification, in particular on variation in participation to tertiary education (see below for a more detailed definition of what we mean by tertiary education). Before going into reviewing the main theories and evidence, it should be added that because of lack of adequate comparative data, our analysis is mostly a cross-sectional one. However, most of the theoretical arguments on this variation are cast in a longitudinal framework: this has to be kept in mind, when comparing the theory we review and our empirical analyses.

2.1 Educational expansion and social stratification: the theories

The starting point of the contemporary debate on the association between the expansion of schooling and social stratification is the classic modernization theory from the 50s and the 60s, both in his economic (human capital) and sociological (structural-functionalism) forms (Ballarino 2007). According to modernization theory, both the expansion of education and the equalization of educational opportunities across social strata (as defined by occupational classes, gender, ethnicity and so on) are driven by economic imperatives. More educated people are more productive, and they are thus more likely to be selected by employers into good and well-paid occupations. The first core mechanism is the link between competition in a market economy and the behaviour of employers, who are constrained by market imperatives to select among prospective employees on the basis of their skills and productivity: if they do not, other employers are likely to get more productive workers and thus drive them out of the market. Thus, more educated people gets better occupations: returns to education increase. The second core mechanism is the spread of information on this advantage all over society, which produces incentives for individuals and families to invest in schooling, thus widening participation to education. Moreover, inequality in schooling decreases because economic imperatives diffuse to the school system, where selection becomes increasingly meritocratic. This can happen bottom up, in decentralized school systems where schools compete to provide the labour markets with the best graduated, or top down, in centralized school systems where school reforms equalize opportunities by lowering costs and by cancelling the organizational and cultural remains of previous structures of the school systems, aimed at the reproduction of social élites instead at the progress of society at large.

Even from such a brief summary, it is clear that modernization theories have an optimistic stance towards the process of expansion of schooling: on one side, they predict equalization in schooling opportunities as a function of decreasing costs and increasing benefits to the investment of education; on the other side, they predict increasing returns to schooling as a function of market competition and of the incentives this provides to employers. More generally, in this theoretical framework the increasing participation to education (vertical destratification) is seen as the dependent variable, while what moves the whole process is social modernization.

In the decades that followed, this general stance changed deeply, in particular because of some important empirical works on the American case, who pictured a situation quite at odds with the optimism of modernization theories. Generally speaking, since the 60s research started considering the expansion of education as the independent variable, and looked for its "effects" on social stratification and mobility. But such effects rarely went into the direction envisaged by modernization theories and by the progressive policies they inspired. The so-called "Coleman Report" (Coleman 1966), commissioned by a progressive government concerned with educational equalization, showed persistent inequality in school performance, associated to ethnicity and family background. Policy efforts to achieve equalization of opportunities by means of investing in the quality of schools had, according to the report, only scarce results. More generally, concurrent research on status attainment (Blau and Duncan 1967) showed that the family background has a double impact on status attainment: first, via inequalities of schooling opportunities associated to the family, second, via a direct channel linking family resources to occupational attainment. A few years later, and with a more sophisticated methodology, the first research project that managed to systematically compare IEO over a wide set of country found substantial persistence in the family's background effect on educational attainment, with the sole exception of Sweden and the Netherlands (Shavit and Blossfeld 1993).

Economists were also a part of this wave of critical research on education and stratification, as neo-marxist scholars challenged human capital theory by observing that school does not produce technical or vocational skills, but a personality fitting the social role the individual will come to achieve (Bowles and Gintis 1976). Employers do not select on productivity, but on the non-cognitive traits that guarantee compliance on the part of the workers and leadership on the part of the managers. Thus, despite economic growth, expanding schooling does not guarantee social equalization of opportunities, but, on the contrary, it produces the reproduction of existing social stratification[2]. Finally, sociologists of education observed the increase of unemployment in highly educated youths, as well as the social unrest that surrounded the expansion of education in the 60s, and developed the theory of the inflation of educational credentials in order to explain both phenomena (Collins 1979). As it happens for the circulation of money, an increase of the number of higher education titles in the population, associated with increasing participation, lowers the signaling value of the titles to employers: returns to education thus decrease, whichever be the mechanism explaining the preference that employers give to educated people in the recruitment process.

2.2 Recent research findings

Concerning IEO, the most recent studies using relative measures of inequality suggest that IOE has declined over time in most EU countries (Ballarino *et al.* 2009; Breen *et al.* 2009). The same has also been found by comparative research restricted to tertiary education (Arum *et al.* 2007). It is thus possible to say that, contrary to the results of previous comparative research (Shavit and Blossfeld 1993), there is evidence that a process of equalization (Breen and Jonsson 2007) is actually taking place. However, controversies still exist concerning the extent of this process, the causal mechanisms

[2] Neo-marxist sociological research also described a similar picture: see for instance the work of Pierre Bourdieu.

that produce it and, perhaps more importantly, the way to interpret the reduction that is observed across cohorts in the coefficients linking family background and school attainment (see Arum *et al.* 2007; Ballarino and Schadee 2010). We have no place in this paper to give more detail about such controversies: suffice it to say that some good empirical works still point to persistent inequality (eg Pfeffer 2008), and that a lot of effort has been put into theoretical work trying to describe the causal mechanisms underlying it. In particular, rational action theory has been used as a means to understand why individuals from the lower classes have a lower motivation to schooling with respect to their counterparts from higher classes (Breen and Goldthorpe 2000). On the other side, researchers who found evidence of decreasing IEO point to different causal chains: in particular, there is some consensus on the importance of two mechanisms. The first is the decrease in school selection that resulted from reforms that increased the length of compulsory education, the second is the increased security that the reforms of the labour market guaranteed to the families of the working classes, providing them with more stable jobs and with income replacements in case of unemployment. Both mechanisms decreased the perception of risk associated, on the part of working-class families, with the long-run investment in education for their children (Erikson and Jonsson 1996; Ballarino *et al.* 2009).

Results on variation of educational returns on the LM are even more scattered, because of stronger measurement and methodological issues. An important theory emerged recently in the economic camp is the so-called skill-biased technological change (SBTC) hypothesis (Acemoglu 2002; di Prete 2005). Its empirical starting point is evidence of a widening wage gap in the US between individuals who hold a college degree and individuals who do not. In order to explain this gap, scholars provide an argument based on market competition, not really different from the modernization theories that were presented above. The evolution of technology, driven by market competition, allows employers to substitute the standardized jobs of poorly educated workers with machines, thus raising productivity and lowering the market situation of the lowly educated[3]. The same process, however, gives more value to the skills of the highly educated, whose work becomes more important in order to manage the development of technology, its application to production and the process of marketing product and services in an increasingly competitive economy.

However, the expansion of participation to higher education that has taken place in Europe since the 90s, and the high levels of unemployment experienced by young people, even when highly educated, has brought back into the public debate the inflation of educational credentials hypothesis (IC), that has also been recently corroborated by research in economic and social history (Goldin 1999; Collins 2000). Generally speaking, both mechanisms described by SBTC and IC hypotheses can be active at the same time. The empirical result would depend on the interplay between the upgrading of the occupational structure, on one side, and the expansion of the population of tertiary graduates on the other side. Comparative evidence suggests that in most European countries the upgrading of the occupational structure has been slower than the expansion of participation to higher education, giving more weight to the IC hypothesis (Müller & Gangl 2003). Moreover, institutions also matter. The reforms of the labour market that took place in most European countries have reduced job security, particularly for the newly hired who are more frequently young and highly educated, and this has worsened university graduates' labour market chances. For instance, in Italy the percentage of university graduates who three years after graduation are found in permanent jobs has gone from about 48% in 1998 to about 33% in 2004 (Ballarino and Bratti 2009; see also Bernardi 2003).

[3] A similar effect can also be imputed to trade globalization, that makes the jobs of the low educated more subject to the competition on the part of similar workers from poorer countries, where wages are lower. This competition can then take the form of migrations from the poorer to the richer countries, or delocalization of production from the latter towards the former.

Another mechanism potentially explaining a decrease in labour market returns to tertiary degrees has been recently put forward by John Goldthorpe and associates (Jackson *et al.* 2005). Just as SBTC theory, this argument looks at the mechanisms governing the process by which graduates are hired into firms. The idea is that employers from the new industries of communication, media and personal services do not select among candidates using their educational titles as a screening device, as predicted by human capital theory as well as by the credential hypothesis. Instead, they increasingly look for those kind of non-cognitive and social skills that are at value in this kind of jobs: but this skills are not produced by schooling, but depend on the family background more than on anything else.

2.3 Three scenarios

We can now come back to the trade-off argument, that was briefly introduced above. Table 1 sums up our argument, with relation to theories and evidence briefly summed up in this paragraph. The scenario in the first row of the table is the one that we would hypothesize to better fit the empirical evidence. It is a *trade-off scenario*, where with vertical destratification of higher education also equality of opportunities increases (equalization: Breen *et al.* 2009; Ballarino *et al*. 2009), while the occupational values of the titles decreases (inflation of educational credentials: Collins 1979; Jackson *et al.* 2005).

Table 1. The three scenarios

Equality of opportunities	Occupational value of titles	Scenario
Increase	Decrease	***Trade-off***
Equal	Decrease	***Worst-off***
Increase	Equal	***Best-off***

In the scenario summarized in the second row of the table, despite more participation to tertiary education, equality of opportunities is stable (persistent inequality: Shavit & Blossfeld 1993; Pfeffer 2008), and occupational returns to education decrease. We would define this as a *worst-off scenario.* Finally, in the third row we have a more optimistic scenario, where with decreasing stratification of tertiary education equality of opportunities also increases and returns do not diminish, or even increase (as it is according to SBTC theory, Acemoglu 2002). This is of course our *best-off scenario*, as envisaged by modernization theories: meritocracy gradually replaces heritage as the core mechanism of social stratification.

3. Data and variables

In order to investigate the aforementioned alternative scenarios we have performed an identical analysis of two parallel data sets, the European Social Survey (four waves 2002-2008) and the module on intergenerational transmission of poverty in EU-SILC (2005). As noted by Firenbaugh (2007, 106) identical replication across data sets allows to gauge uncertainty in the results due to specific exclusion errors and idiosyncratic measurements errors in a given data set. If, then, the analysis yields similar results for different data sets the confidence in the validity of the findings is greatly enhanced.

We consider 23 European countries (see the table 2 below for the complete list) that have taken part to both ESS and EU-SILC, plus Israel in ESS and Lithuania in EU-SILC. For the analysis of IEO we analyse three birth cohorts: 1946-55; 1956-1965; 1966-1975. With regard to the study of IOO, unfortunately both data sets only provide information on the occupation at the time of the survey, and not on occupation at entry in the labour market. With this type of cross-sectional information it is not possible to distinguish cohort differences from career- and age-related differences in educational

returns[4]. For this reason, in this second part of the analysis we focus only on the youngest cohort, those born between 1965 and 1975.

We measure educational achievement with a dummy variable equal to 1 for those who have completed tertiary education, defined as ISCED 97 categories 5 and 6[5]. For parental education, we take the highest of the father's and mother's level of education and recode it into a three-level classification that distinguishes among lower secondary education or less (ISCED 97 categories 0-2), upper secondary education (categories 3 and 4) and tertiary education (categories 5 and 6). With regard to occupational attainment, we consider the prestige score (SIOPS) for the current occupation or the last occupation for those who were not employed at the time of the survey (Ganzeboom and Treiman 1996). This is a continuous hierarchical scale, with scores that range between 12 and 78, with the highest score for medical doctors and university professors, and the lowest for shoeshiners, billposters and other elementary service occupations. We also use an alternative measure of occupational attainment, the probability of entering the service class. We define a dummy variable equal to 1 for those who have occupations in the upper class of high- and mid-level professionals and high- and mid-level managers. This is the service class (I and II) according to the EGP class scheme (Goldthorpe 2000). Finally, the size of tertiary education is measured as the proportion that has achieved tertiary education in each birth cohort in a given country. This can also be conceived as an indicator of educational inequality, namely of what has been defined the "vertical stratification" of a given educational system (Allmendinger 1989).

There are two important differences in the measurement of the aforementioned variables in the EU-SILC and ESS surveys that should be discussed. First of all, in EU-SILC education is measured along a simplified version of the ISCED 97 classification that distinguishes six levels of education. Its main limitation is that it neglects horizontal distinctions between general/academic tracks and vocational oriented ones within each level (Schneider and Müller 2009). This problem is most serious at the level of upper secondary (ISCED 3) where most countries offer clearly different tracks and courses of study. In the ESS the measurement of education is more precise and an extensive effort has been made to harmonize the classification of education across countries and waves[6]. Since we focus on the comparison between the top and bottom of the educational distribution, ie tertiary education and lower education and less, the lack of information of horizontal stratification is not too much of a concern for the present study. It is, however, more worrisome that in EU-SILC the conversion of idiosyncratic national classification into the ISCED categories is less standardized than in the ESS. In the case of ESS the recoding of country specific information on education levels into an ISCED 97 equivalent classification was performed centrally by an educational specialist. Moreover, the original country codings are available in the distributed file, and it is thus possible to check the recoding performed in order to harmonize the national codings. We extensively used work already done on this by S. Schneider (2009; 2010), following her recoding proposals for the countries for which they were available[7]. On the contrary, for EU-SILC no detailed description of the procedures used in the various countries is available (Schneider and Müller 2009, 2). Country differences in coding procedures are

[4] Imagine one finds that in 2005 highly educated subjects in the cohort 1946-55 earn more and are employed in more prestigious jobs than similarly educated subjects in the cohort 1965-75. In accounting for this, there is no way to distinguish a cohort effect (education paid and pays more in the older cohort), and an age effect (in 2005 the two cohorts were in different stages of their employment career).

[5] Higher education could also be defined in another and more extended way, including also ISCED level 4 (post-secondary, not tertiary education). As a robustness check, we also used this definition, and results of the analyses reported below did not change qualitatively.

[6] See the documentation report: http://ess.nsd.uib.no/ess/doc/Education_Upgrade_ESS1-4.pdf

[7] See Meschi and Scervini (2010).

thus likely to underlie the differences that we observe in the percentage of tertiary education computed with the EU-SILC and ESS data, as reported in Table 2. These differences are marked (above 10 per cent) in six out of 24 countries, with lower figures for tertiary education in the ESS in Austria, Germany and Ireland and higher ones in Latvia, Norway and Sweden. The differences between of the two surveys do not seem, therefore, to follow a systematic pattern. Moreover, if it is reasonable to assume, as it seems, that the measurement error in a given cohort by country cluster is consistent for individual and parental education, then the resulting association between the two variables is insensitive to the differing coding procedures in the two surveys [8].

Table 2. Participation to higher education by cohort of birth, according to ESS and EU-SILC

	1946-55			1956-65			1966-75		
	ESS	EU-SILC	diff.	ESS	EU-SILC	diff.	ESS	EU-SILC	diff.
Austria	0.09	0.18	-0.10	0.10	0.19	-0.10	0.09	0.23	-0.14
Belgium	0.28	0.31	-0.03	0.34	0.35	-0.01	0.42	0.46	-0.03
Czech Republic	0.09	0.10	-0.01	0.13	0.15	-0.02	0.10	0.14	-0.04
Germany	0.32	0.43	-0.11	0.33	0.42	-0.09	0.30	0.38	-0.08
Denmark	0.29	0.26	0.03	0.31	0.28	0.03	0.37	0.33	0.04
Estonia	0.28	0.29	0.00	0.33	0.29	0.04	0.31	0.29	0.02
Spain	0.13	0.17	-0.03	0.21	0.25	-0.05	0.28	0.38	-0.09
Finland	0.32	0.29	0.03	0.41	0.37	0.04	0.49	0.44	0.05
France	0.22	0.18	0.05	0.28	0.24	0.04	0.42	0.38	0.03
Greece	0.11	0.15	-0.05	0.13	0.22	-0.09	0.20	0.28	-0.08
Hungary	0.18	0.14	0.03	0.16	0.15	0.01	0.17	0.17	0.00
Ireland	0.12	0.18	-0.06	0.15	0.23	-0.08	0.19	0.38	-0.18
Israel	0.33	-	-	0.27	-	-	0.38	-	-
Italy	0.10	0.12	-0.01	0.09	0.12	-0.03	0.15	0.17	-0.02
Lithuania	-	0.22	-	-	0.22	-	-	0.30	-
Luxemburg	0.18	0.16	0.02	0.18	0.15	0.03	0.29	0.26	0.02
Latvia	0.23	0.18	0.05	0.30	0.19	0.11	0.32	0.20	0.12
Netherlands	0.24	0.30	-0.06	0.27	0.33	-0.07	0.31	0.40	-0.09
Norway	0.36	0.28	0.08	0.37	0.30	0.07	0.49	0.38	0.11
Poland	0.11	0.11	0.00	0.14	0.13	0.01	0.20	0.22	-0.02
Portugal	0.08	0.10	-0.02	0.09	0.12	-0.02	0.16	0.15	0.01
Sweden	0.36	0.29	0.07	0.36	0.28	0.09	0.48	0.37	0.11
Slovenia	0.11	0.07	0.04	0.16	0.13	0.04	0.21	0.19	0.01
Slovakia	0.16	0.16	0.00	0.17	0.17	0.00	0.17	0.17	0.01
United Kingdom	0.29	0.29	-0.01	0.34	0.34	0.00	0.37	0.39	-0.03

Second, EU-SILC data are also less precise in the measurement of occupations which are coded with two digit ISCO codes, while ESS provides four ISCO digits. The prestige score in EU-SILC are averages of the more detailed scores of the four digits occupations that fall within each two digit group

[8] A basic property of the correlation index r is that r(Y,X) =r(Y-k, X-k). Let then ε be the measurement error due to coding procedure. The observed level of education A is then equal to the true value α plus ε, A= α + ε. If the same ε applies to the parental education and B is the observed parental education and β the true one, then r(A, B)=r(A-ε, B-ε)= r(α,β)

(Ganzeboom and Treiman 1996). Accordingly, measurement of prestige is less precise and there is less variation in the prestige distribution in EU-SILC than in ESS[9].

3.1 The research strategy

Our analysis consists of two steps. In the first step we extract social origin effects[10] on educational attainment and education effects on labour market outcomes from regressions on individual data for specific birth cohorts in each of the countries under analysis. In the second step we examine the empirical association between the uncovered effects and our aggregate measure of participation in tertiary education for each cohort by country cluster. In other words, we investigate the association between our measures of IEE and IOO and the size of tertiary education in each cohort by country cluster. In the first step, therefore, the units of analysis are individuals in a given cohort and country, while in the second step the unit of analysis become the cohort by country clusters. Similar two-step research designs have been previously employed in social stratification research to analyse cross national estimates of inequality of educational opportunity (Arum et al. 2007; Pfeffer 2008), educational returns (Müller and Shavit 1998) and ethnic penalties in the labour market (Heath 2007).
In the case of IEO, let t_{ik}, the individual-level educational attainment, be a function of gender and social origin for each of the cohort by country clusters k, plus an error term u. The first step regression is then:

$$t_{ik} = \alpha + p_{2ik}\delta_{2k} + p_{3ik}\delta_{3k} + g_{ik}\gamma_k + u_{ik} \quad \text{(1a)}$$

In our analysis then t_{ik} is a dummy variable equal to 1 if the subject has achieved tertiary education, p_{2ik} and p_{3ik} are two dummy variables that are equal to 1 if the highest parental education is secondary or tertiary education, respectively. The model also includes a dummy variable for gender, g_{ik}. We assume that u_{ik} is normally distributed and we estimate equation (1a) with a linear probability model. Our interest lies in the δ_{3k}, that expresses the advantage that students from tertiary educated families have in achieving tertiary education when compared to students from families with compulsory education only. Since in the analysis on IEO we have 72 cohorts by country clusters (3 birth cohorts by 24 countries), we get 72 δ_{3k}. that are indicators of the strength of inequality in the achievement of tertiary education by social background, in each cohort by country cluster.
In the second step we analyse the gross association between the δ_{3k} coefficients and overall participation in higher education. Let d_{3k} be the estimate of δ_{3k} from the IEO equation (1a). The second step equation is then:

$$d_{3k} = \omega + T_k\lambda_k + \varepsilon_k \quad \text{(2a)}$$

Where T_k is the proportion of subjects who have achieved higher education in the cohort by country k. Following Brunello and Cappellari (2008, 567), estimates of equations 2a are based on weighted least squares, with weights proportional to the inverse of the squared standard errors for d_{3k} estimated in 1a, in order to account that the dependent variable has been generated from a first stage estimation. This type of weighting procedure seems particularly relevant when the first stage estimation are based on

[9] Numbers for this are not reported for lack of space, but are available from the authors.
[10] According to the aims of the paper, we use the term "effect" in a descriptive sense, without postulating causality.

small N sample and there is no trivial uncertainty associated to the estimates that enter as dependent variable in the second step equation[11].

The coefficient λ_k in 2a expresses the expected variation in the advantage in achieving higher education for those coming from highly educated families associated to a one percent variation in the proportion who achieve tertiary education. This coefficient indicates whether inequality by social background in achieving tertiary education is smaller in cohorts and countries where larger proportions of students achieve tertiary education. This last question clearly would become irrelevant and at its extreme tautological, as proportion of attainment tertiary education T_k approaches to 100% (Lucas 2008). In fact, if everybody or almost everybody achieved a given level of education, any type of inequality is driven to 0. In the data under analysis, however, T_k varies between to a minimum of 7 per cent to a maximum value of 49 per cent, values well distant from a full saturation.

In the case of IOO, let y_{ik} be the individual level outcome in the labour market, as a function of gender and the level of education achieved for each country *h*, plus an error term φ. The first step equation for the analysis of IOO is then

$$(1b) \qquad y_{ik} = \alpha + x_{2ik}\beta_{2k} + x_{3ik}\beta_{3k} + g_{ik}\pi_k + \varphi_{ik}$$

where y_{ik} is either the prestige score associated to the occupation or the probability of being in the service class; x_{2ik} and x_{3ik} are dummy variables for having achieved upper secondary or tertiary education, respectively; g_{ik} stands for gender as in (1a). Our main concern is in this case with the β_{3k} coefficients that express the occupational returns of tertiary education when compared to compulsory education in each cohort and country cluster *k*. In this case we consider only the youngest birth cohort in each country and equation (1b) produces therefore 24 estimates of β_{3k}. When y_{ik} is the ISEI score we use OLS regression, while when y_{ik} is the probability to access to the service class we estimate a linear probability model.

In the second step we treat the estimates for β_{3k} as dependent variable and regress them on the level of participation in tertiary education in the same cohort and country *h*. The second step equation is then:

$$(2b) \qquad b_{3k} = \omega + T_k\vartheta_k + \upsilon_k$$

Where b_{3k} are the estimate of β_{3k} from the IOO equation (1b). As in 2a, T_k is the proportion of subjects who have achieved higher education in the youngest cohort in country *k*. We also estimate a different specification of the model, adding a further regressor (S) to control for the demand of higher educated people on the part of the economy. As a measure of demand, we use the proportion of individuals that in country k is employed in the professional and managerial class (EGP I and II), and estimate:

$$(2c) \qquad b_{3k} = \omega + T_k\theta_k + \upsilon_k$$

In both macro-equations we use weighted least squares, as for the regression 2a, with weights proportional to the inverse of the squared standard error for β_{3k} estimated in 1b.

[11] None of the aforementioned papers that use a similar two step research design takes into account that the dependent variable in the second step are estimated coefficient with a certain level of uncertainty associated to each of them. Admittedly our substantive conclusions would not change were the second stage equation not weighted. However, the change in the size of the coefficients is substantial, especially in the case of the ESS where sample sizes in the first step estimation are smaller.

The sample size of each cohort by country cluster for the individual level first step regression (1a) and (1b) are reported in Appendix table A1. In general the sample size is larger in EU-SILC than in ESS and therefore the estimates should be more reliable in the former dataset.

3.2 Absolute versus relative measures of inequalities

Our synthetic measures of inequality for each cohort and country cluster are the δ_{3k} and β_{3k} in equation 1a and 1b respectively. Being these equations OLS regressions or linear probability models, we then use absolute measures of inequality, instead of relative measures, such as the odds ratios that that are still the cornerstone of much of the social mobility and educational inequality research (Breen 2004). There are, however, three reasons for using an absolute measure of inequality such as the probabilities of achieving tertiary education or expected differences in prestige.

First, there are claims that more attention should in general be paid to explain absolute measures of social mobility and inequality[12]. Second, the direct comparison of coefficients or odds ratios from logistic regression across cohorts or countries is inappropriate (Mood 2010). Within our research design one should then use the first step estimation to extract average marginal effects that in practice are almost equivalent to the coefficients of the linear probability models that we do estimate. Third, the key reason to use relative measures of inequality, such as the odds ratios, that are insensitive to differences in the marginal distribution of education and occupation, does not seem to apply here. Quite to the contrary, we are actually interested in how variations in the distribution of tertiary education affects IEO and IOO, ie we are precisely interested in the effect of the marginals on inequality. We need, therefore, to use a measure of inequality that is sensitive to the marginal distribution in the first step, so that the relationship between inequality and tertiary participation, if any, can become evident with the second step estimation.

3.3 Robustness checks

We have performed the following sensitivity checks to test the robustness of our findings: a) we have estimated our second step models without the weights based on the standard error of the first step equation; b) we have performed the analysis on IOO separately for men and women, to limit the possibility of a sample selection bias among women; c) we measured employment returns to tertiary education (IOO) in terms of employment probabilities, also separating men and women; d) we have also controlled for the family background in the analysis of returns to education[13]. All these complementary analyses point to the robustness of the findings that we now turn to discuss.

4. Empirical results

In the following section we comment on the results of second steps of our analyses. We focus therefore on the macro associations between the level of vertical stratification of tertiary education in a given cohort by country cluster and various measures of inequality of educational outcomes and educational returns in the same cohort by country cluster[14].

Table 3 presents the results for the analysis of the association between the inequality in achieving tertiary education and the proportion of tertiary educated in each of the 72 cohort by country cluster that we study. The first important finding to stress is the high consistency between the estimates based on the identical analysis of the two distinct data sets. Not only do we find a negative correlation

[12] See the conclusions in Breen (2004).

[13] Results are presented in the Appendix tables A4-A9.

[14] The detailed coefficients of the individual level regressions of the first step estimations by cohort and country cluster are reported in Appendix tables A2 and A3.

between the measures of inequality in access to tertiary education by cohort both in the ESS and EU-SILC, but also the size of the estimates is remarkable close. The correlation turns out to be equal to -.34 according to the EU-SILC estimation and -.40 according to the ESS estimation. Substantively, we do find therefore that larger proportions of tertiary educated are associated to a smaller inequality by social background. The bottom panel of table 3 shows the estimates of the λ_k coefficients of the equation 2a, that allow to better quantify the size of this association.

Table 3. Participation to higher education and educational inequality*

	EU-SILC	ESS
correlation	-0.34	-0.40
sig.	.000	.0005
regression		
constant	0.50	0.56
λ_k	-0.13	-0.18
$p(\lambda_k)$	00	.008
R^2	0.19	0.16
obs	72	72

* see text for the definition of the variables

The variable for the size of tertiary education has been recoded to vary between 0 and 1, so that the effect of the constant can be interpreted as the expected advantage in access to tertiary education when the size of tertiary education is at its minimal value. In that case, according to the EU-SILC estimates, those coming from a highly educated background have a probability of accessing tertiary education that is 50 per cent higher than for those coming from a lower educated background. This advantage reduces to 34 per cent points when tertiary education is at its largest. This accounts for a reduction of about one third in our IEO measure. In the case of the ESS the reduction is slightly lower, at about one fourth of the maximal inequality.

A strong consistency in the estimates based on the two separate data sets is also found for the analysis of educational returns, presented in tables 4 and 5. As explained in the previous section, in this case we focus only on the most recent cohorts, and therefore N reduces to 24. The top panel of table 4 shows the correlations between the proportion of tertiary educated and the gain in occupational prestige secured by tertiary education when compared to lower secondary education. Both in the ESS and EU-SILC we find that the returns of tertiary education are smaller in those countries where tertiary education is more diffuse. Again the correlation coefficients turn out to be almost identical in the two separate estimations (-.77 in EU-SILC and -.74 in ESS). The bottom panel presents the θk estimates based on the 2a OLS regressions. As in the previous analysis, T has been rescaled so that it minimal value is equal to 0 and its largest value is equal to 1. The effect of the constant refers, then, to the minimal size of tertiary education, while the effect of T express how the returns to tertiary education varies when one passes from the smallest to the largest size of tertiary education[15]. Model 1 shows that the advantage secured by tertiary education when tertiary education is at its lowest values accounts for

[15] The smallest proportion of tertiary educated in the cohort 1966-1975 was 14 per cent in the Czech Republic, while the largest was 46 per cent in Belgium (according to EU-SILC). See Table 2..

about 24 and 28 prestige points according to the EU-SILC estimation and the ESS, respectively[16]. On the other hand, where tertiary education is at its maximal diffusion, this advantage reduces in a similar way, by about 34 per cent in EU-SILC and 40 per cent in ESS.

Table 4. Participation to higher education and returns to higher education (prestige score)*

	EU-SILC	ESS	EU-SILC	ESS
correlation	-0.77	-0.74		
sig.	.00	.00		
regressions:	model 1		model 2	
constant	23.5	28.1	23.2	28.5
θ_k	-8.6	-11.3	-9.1	-9.7
$p(\theta_k)$	0.00	0.00	0.002	0.02
S			.94	-2.3
p(S)			0.78	0.48
R^2	0.59	0.54	0.59	0.56
obs	24	24	24	24

* see text for the definition of the variables

Table 5. Participation to higher education and returns to higher education (access to the service class)*

	EU-SILC	ESS	EU-SILC	ESS
correlation	-0.58	-0.63		
sig.	.000	.001		
regressions:	model 1		model 2	
constant	0.74	0.75	0.73	0.68
θ_k	-0.22	-0.16	-0.22	-0.22
$p(\theta_k)$	0.00	0.00	0.00	0.001
S			0.01	0.26
p(S)			0.96	0.07
R^2	0.33	0.40	0.33	0.46
obs	24	24	24	24

* see text for the definition of the variables

More substantively, if one focuses on the ESS estimates Austria, the Czech Republic, Italy, Hungary, Portugal and Ireland are the countries with the lowest level of tertiary education (below 20 percent), while Finland, Norway and Sweden are the countries with largest proportion, close to 50 per cent (see table 2 above) . In the first set of countries tertiary education guarantees on average an improvement of about 28 prestige points, while in the latter set of countries the advantage goes down to 17 points. A

[16] The largest effect in ESS is due to the fact the measure of prestige refers to occupations coded with two ISCO codes in EU-SILC and four ISCO codes in ESS. In the latter survey there is therefore more variation in the distribution of prestige.

distance of 28 prestige points corresponds for instance to a situation where those with tertiary education access professionals positions (ISCO code 2000, with average prestige equal to 70) and those with lower education land in shop and market sales occupations (ISCO code 5000, with an average prestige of 40). On the other hand, 17 points account approximately for the distance between professionals and associate professionals and technicians (ISCO code 3000, with an average prestige score of 54).
In model 2 we test whether the association between the size of tertiary education and educational returns varies if one takes also into account the demand for highly qualified employment (see Bernardi et al. 2004). The variable S refers to the proportion employed in the professional and managerial class (EGP I and II) in the same cohort by country cluster. Leaving aside formidable issues of endogeneity, the model provides a descriptive picture of the association between educational returns and macro indicators of both the supply and demand of tertiary educated workers[17]. The model shows that after controlling for the demand, the negative association between the size of tertiary education and educational returns persists. The estimates for S, in fact, are non significant, at the conventional levels, in both separate analyses.
In table 4 educational returns are measured as differences in the probability of access to the service class between those with a tertiary education and those with lower secondary. Beside the strong consistency in the ESS and EU-SILC estimation, the main story is the same as for the analysis based on the occupational prestige score. We find a negative association between the size of tertiary education and educational returns (model 1) that is confirmed also controlling for the size of the professional and managerial class. In this case when moving from the minimal proportion of tertiary educated to the maximal one, the reduction in the educational returns is between 30 per cent in the EU-SILC data and about 20 per cent in ESS. It is thus smaller than the one found in the analysis of prestige. Also in this case, adding a measure for the demand of highly skilled labour does not change the relation between size of tertiary education and occupational returns to the tertiary title.

5. Conclusions

It is now possible to come back to the three scenarios that we described above, to discuss them in the light of the evidence presented in the previous paragraph. Evidence points clearly towards the *trade-off scenario*: on one side, we found participation to tertiary education to be negatively associated with the level of inequality in achieving a tertiary degree, while on the other side we also found it to be negatively associated with occupational returns. Both associations have been validated by a parallel analysis of independent data sets, and they are robust to a large battery of sensitivity checks. As found by most of recent research on IEO, where there is a larger participation to tertiary education, inequality in achieving this level of education decreases. However, a larger participation to tertiary education in EU is also associated to lower occupational returns to the title, whichever is the measure used for the returns.
One should note that our cross-sectional design is ill-equipped to provide a stringent test on the dynamics of educational expansion and its consequences for IOE and IOO. However, our findings portray a basic picture of the association between the size of tertiary education and inequality in educational outcome and returns contemporary EU. Keeping the limitations of our analysis in mind, we conclude by raising attention to the substantive and policy implications of the trade-off scenario. Our results suggest that a large participation to tertiary education is associated to equalization of educational inequality, as progressive policy-makers have been stating since long. However, their trust in the

[17] The demand of highly qualified labour might foster participation at the university. However, high numbers of university graduates might also bring about an upgrading of the occupational structure and favour the creating of new highly skilled jobs. Disentangling these different causal mechanisms stands outside the ambition and possibilities of this paper.

opening up of tertiary education as a means to introduce a more meritocratic allocation of individuals to occupational positions seems to have a weak empirical basis: on the contrary, when more people get a tertiary degree the occupational value of the degree decreases, as predicted some decades ago by the rather pessimistic credential inflation theory. Thus, we think that some discussion should take place about policy statements as the ET 2020 by the EU commission that was recalled above, which sets a benchmark of 40% tertiary educated in the population of each country. According to our results, it is by no means certain that this kind of investment will have the meritocratic outcomes it is expected to nor that it will promote a general occupational upgrading. On the contrary, something different from what the policy makers envisage could happen. For instance, a general decrease of the occupational value of tertiary titles could be associated with a strengthening of the differences among titles and their holders (their horizontal stratification), with titles released from elite universities becoming much more valuable than the average ones. This decrease, as suspected by some scholars, could also produce an increase of the occupational value of non-cognitive skills, not trasmitted via education, but in the realm of the family, thus reinforcing the intergenerational reproduction of existing inequalities.

References

Acemoglu, D. (2002). Technical Change, Inequality and the Labor Market. *Journal of Economic Literature* 40, pp. 7-72.

Allmendinger, J. (1989). "Educational System and Labour Markets Outcomes." European Sociological Review:231-250.

Arum, R., Gamoran, A., Shavit, Y. (2007), More Inclusion Than Diversion: Expansion, Differentiation and Market Structure in Higher Education, in Shavit, Arum and Gamoran, eds., Stratification in Higher Education. A Comparative Study, Stanford: Stanford UP, pp. 1-35.

Ballarino, G. (2007), "Istruzione e mercato del lavoro", in M. Regini, ed., La sociologia economica contemporanea, Bari-Roma: Laterza, pp. 231-257.

Ballarino, G., F. Bernardi, H. Schadee, and M. Requena. (2009). "Persistent Inequalities? Expansion of education and class inequality in Italy and Spain." European Sociological Review 25: 123-138.

Ballarino, G., Bratti, M. (2009), Field of Study and University Graduates' Early Employment Outcomes in Italy during 1995–2004, Labour, 23 (3), pp. 421-457.

Ballarino, G., Schadee, H. (2010), Allocation and distribution. A discussion of the educational transition model, with reference to the Italian case, Research in Social Stratification and Mobility 28, pp. 45–58.

Bernardi, F. (2003), Returns to Educational Performance at Entry into the Italian Labour Market, European Sociological Review, 19, 1, 25-40.

Bernardi, F., Gangl, M., van de Werfhorst, H. (2004), The From-School-to-Work Dynamics. Timing and Quality of the First Job in Italy, the Netherlands and the United States, 1980-1998, Madrid: Fundacion Juan March Estudio/Working Paper 2004/201.

Blau, P., Duncan, O. D. (1967), The American Occupational Structure, Wiley, New York

Bowles, S. and H. Gintis (1976), Schooling in Capitalist America: Educational Reform and the Contradictions of Economic Life, NewYork: Basic Books.

Breen, R. and J. Jonsson (2005). "Inequality of opportunity in comparative perspective: Recent Research on EducationalAttainment and Social Mobility." Annual Review of Sociology 31:223–43.

Breen, R., Jonsson, J. (2007), Explaining Change in Social Fluidity: Educational Equalization and Educational Expansion in Twentieth-Century Sweden, American Journal of Sociology 112:1775-1810.

Breen, R., R. Luijkx, W. Müller, and R. Pollak. 2009. "Non-Persistent Inequality in Educational Attainment: Evidence from Eight European Countries." " American Journal of Sociology 114:1475-1521.

Breen. R. (2004), Social mobility in Europe, Oxford: Oxford UP.

Brunello, G., Cappellari, L. (2008), The labour market effects of Alma Mater: Evidence from Italy, Economics of Education Review 27:564-574.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., York, R. L. (1966), Equality of Educational Opportunity, Washington, US Government Printing Office.

Collins, R. (1979), The credential society: An historical sociology of education and stratification, New York: Academic Press.

Collins, R. (2000), Comparative and Historical Patterns of Education, in M. T. Hallinan, ed. Handbook of the Sociology of Education, New York: Kluwer, pp. 213-239.

DiPrete, Thomas A., ed., (2005). European Labor Markets: Inequality, Governance, and Change. Special Issue of Work and Occupations.

Esping-Andersen, G., Regini, M. eds (2000), Why Deregulate Labour Markets?, Oxford: Oxford UP.

Firebaugh, G. (2008). Seven Rules for Social Research. Princeton, NJ: Princeton University Press.

Ganzeboom, H., Treiman, D. (1996), "Internationally Comparable Measures of Occupational Status for the 1988 International Standard Classification of Occupations", Social Science Research, 25:201–239.

Goldthorpe, J. (2000). On Sociology. Oxford: Oxford University Press.

Goldin, C. (1999), Egalitarianism and the Returns to Education during the Great Transformation of American Education, Journal of Political Economy, 107, S65-S94.

Heath, A. F., Cheung, S. I., eds. (2007), Unequal Chances: Ethnic Minorities in Western Labour Markets, Oxford: British Academy/Oxford

Kivinen, O., Hedman, J., Kaipainen, P. (2007), From Elite University to Mass Higher Education. Educational Expansion, Equality of Opportunity and Returns to University Education, Acta Sociologica, 50: 231-147.

Jackson, M. Goldthorpe, J. and Mills, C. (2005) Education, Employers and Class Mobility, Research in Social Stratification and Mobility, 3-33.

Lucas, S. 2009. "Stratification Theory, Socioeconomic Background, and Educational Attainment. A Formal Analysis." Rationality and Society 21:459-511.

Meschi, E., Scervini, F. (2010), A new dataset of educational inequality, research paper, university of Milan - GINI project.

Mood, K. (2010), Logistic Regression: Why We Cannot Do What We Think We Can Do, and What We Can Do About it, European Sociological Review 26: 67-82.
Müller, W., Gangl, M. eds (2003), Transitions from Education to Work in Europe. The Integration of Youth into EU Labour Markets, Oxford: Oxford UP.
Müller, W., Shavit, Y. (1998), The Institutional Embeddedness of the Stratification Process: A Comparative Study of Qualifications and Occupations in Thirteen Countries, in Shavit and Müller, eds., From School to Work. A Comparative Study of Educational Qualifications and Occupational Destinations, Oxford: Clarendon, 1-48.
Pfeffer, F. 2008. "Persistent Inequality in Educational Attainment and its institutional context." European Sociological Review 24:543-565.
Schneider, S. L. and W. Müller. 2009. "Measurement of Education in EU-SILC – Preliminary Evaluation of Measurement Quality." in EQUALSOC EDUC/INCDIS Meeting on the Potential of the EU-SILC Intergenerational Module. Dublin.
Schneider, S.L. (2009). Confusing credentials: The cross-nationally comparable measurement of educational attainment, DPhil thesis. Nuffield College, Oxford: University of Oxford, http://ora.ouls.ox.ac.uk/objects/uuid:15c39d54-f896-425b-aaa8-93ba5bf03529
Schneider, S. (2010), Nominal comparability is not enough: (in-)equivalence of construct validity of cross-national measures of educational attainment in the European Social Survey, Research in Social Stratification and Mobility, 28(3), pp. 343-357.
Shavit, Y., Blossfeld, H.-P., eds (1993), Persistent Inequalities. A Comparative Study of Educational Attainment in Thirteen Countries, Boulder: Westview Press.
Shavit, Y., Yaish, M., Bar-Haim, E. (2007), The persistence of persistent inequality, in Scherer, S., Pollak, R., Otte, G., Gangl, M., eds, From Origin to Destination. Trends and Mechanisms in Social Stratification Research, Berlin: Campus.
van de Werfhorst, H., Mijs, J. (2010), Achievement Inequality and the Institutional Structure of Educational Systems: A Comparative Perspective, Annual Review of Sociology, 36, 407-28.

Appendix 1: Descriptive tables

Table A1. Sample size, by cohort

	EU-SILC			ESS		
	1946-55	1956-65	1966-75	1946-55	1956-65	1966-75
Austria	1,473	1,743	1,499	611	1,015	666
Belgium	1,367	1,511	1,343	988	1,180	1,001
Czech Republic	1,588	1,200	1,321	958	733	812
Germany	3,698	4,835	2,978	1,683	2,122	1,516
Denmark	946	1,129	1,029	1,078	1,054	948
Estonia	1,114	1,380	1,172	571	639	676
Spain	4,106	5,125	4,661	955	1,199	1,269
Finland	2,227	1,943	1,546	1,489	1,306	1,119
France	2,485	2,547	2,476	1,092	1,075	1,179
Greece	1,784	1,833	1,842	889	1,054	1,176
Hungary	2,506	2,153	2,348	1,103	905	979
Ireland	1,279	1,413	960	924	856	886
Israel	-	-	-	338	525	689
Italy	7,334	7,820	7,759	455	501	452
Lithuania	1,460	1,829	1,235	-	-	-
Luxemburg	727	674	622	316	325	268
Latvia	885	1,100	1,040	219	307	276
Netherlands	1,410	1,611	1,595	1,255	1,364	1,289
Norway	933	1,039	1,060	1,185	1,267	1,213
Poland	6,712	6,582	5,398	1,221	1,213	1,052
Portugal	1,433	1,647	1,424	1,166	1,074	1,094
Sweden	848	827	843	1,126	1,085	1,119
Slovenia	1,262	1,186	1,220	810	863	792
Slovak Republic	2,181	2,327	1,783	839	790	813
United Kingdom	2,356	2,392	2,246	945	985	1,004

Table A2. Coefficients extracted from first step estimations*: educational inequality in achievement of tertiary education, parents with tertiary education versus parents with lower education or less; and proportion with tertiary education, by cohort by country cluster**.

	EU-SILC		ESS	
	IEO	% tertiary	IEO	% tertiary
Austria	0.39	0.09	0.51	0.18
Austria	0.45	0.10	0.37	0.19
Austria	0.46	0.09	0.43	0.23
Belgium	0.47	0.28	0.52	0.31
Belgium	0.54	0.34	0.56	0.35
Belgium	0.55	0.42	0.51	0.46
Czech Republic	0.39	0.09	0.45	0.10
Czech Republic	0.49	0.13	0.46	0.15
Czech Republic	0.41	0.10	0.42	0.14
Germany	0.35	0.32	0.38	0.43
Germany	0.29	0.33	0.32	0.42
Germany	0.36	0.30	0.33	0.38
Denmark	0.46	0.29	0.40	0.26
Denmark	0.47	0.31	0.33	0.28
Denmark	0.40	0.37	0.36	0.33
Estonia	0.44	0.28	0.49	0.29
Estonia	0.52	0.33	0.36	0.29
Estonia	0.47	0.31	0.43	0.29
Spain	0.74	0.13	0.52	0.17
Spain	0.40	0.21	0.56	0.25
Spain	0.57	0.28	0.41	0.38
Finland	0.39	0.32	0.44	0.29
Finland	0.38	0.41	0.37	0.37
Finland	0.33	0.49	0.38	0.44
France	0.54	0.22	0.54	0.18
France	0.54	0.28	0.45	0.24
France	0.59	0.42	0.49	0.38
Great Britain	0.43	0.29	0.41	0.29
Great Britain	0.40	0.34	0.36	0.34
Great Britain	0.39	0.37	0.35	0.39
Greece	0.48	0.11	0.45	0.15
Greece	0.44	0.13	0.48	0.22
Greece	0.52	0.20	0.55	0.28
Hungary	0.66	0.18	0.53	0.14
Hungary	0.54	0.16	0.53	0.15
Hungary	0.62	0.17	0.55	0.17
Ireland	0.43	0.12	0.45	0.18
Ireland	0.56	0.15	0.62	0.23
Ireland	0.42	0.19	0.56	0.38
Israel	0.38	0.33		
Israel	0.55	0.27		
Israel	0.54	0.38		
Italy	0.67	0.10	0.56	0.12
Italy	0.60	0.09	0.54	0.12
Italy	0.48	0.15	0.60	0.17

Lithuania			0.48	0.22
Lithuania			0.48	0.23
Lithuania			0.48	0.27
Luxemburg	0.69	0.18	0.43	0.16
Luxemburg	0.65	0.18	0.64	0.15
Luxemburg	0.49	0.29	0.57	0.26
Latvia	0.61	0.23	0.53	0.18
Latvia	0.32	0.30	0.48	0.19
Latvia	0.36	0.32	0.38	0.20
Netherlands	0.54	0.24	0.45	0.30
Netherlands	0.40	0.27	0.43	0.33
Netherlands	0.43	0.31	0.38	0.40
Norway	0.61	0.36	0.39	0.28
Norway	0.39	0.37	0.36	0.30
Norway	0.41	0.49	0.25	0.38
Poland	0.51	0.11	0.55	0.11
Poland	0.55	0.14	0.50	0.13
Poland	0.62	0.20	0.63	0.22
Portugal	0.37	0.08	0.50	0.10
Portugal	0.69	0.09	0.48	0.12
Portugal	0.56	0.16	0.47	0.15
Sweden	0.37	0.36	0.32	0.29
Sweden	0.32	0.36	0.41	0.28
Sweden	0.38	0.48	0.35	0.37
Slovenia	0.37	0.11	0.33	0.07
Slovenia	0.52	0.16	0.63	0.13
Slovenia	0.41	0.21	0.40	0.19
Slovak Republic	0.49	0.16	0.49	0.16
Slovak Republic	0.61	0.17	0.51	0.17
Slovak Republic	0.51	0.17	0.38	0.17

* see text for the definition of the variables

** oldest cohort within each country cluster on the top row

Table A3. Coefficients extracted from first step estimations*: educational returns measured in terms of prestige and access to EGP I-II with the first occupation; and proportion with tertiary education, cohort 1966-1975

	EU-SILC			ESS		
	prestige	EGP I-II	% tertiary	prestige	EGP I-II	% tertiary
Austria	16.67	0.45	0.23	19.96	0.70	0.09
Belgium	18.35	0.56	0.46	22.31	0.76	0.42
Czech Republic	26.47	0.82	0.14	28.02	0.73	0.10
Germany	18.87	0.65	0.38	20.99	0.60	0.30
Denmark	18.76	0.59	0.33	21.48	0.70	0.37
Estonia	20.09	0.74	0.29	22.49	0.62	0.31
Spain	17.38	0.54	0.38	21.90	0.63	0.28
Finland	16.12	0.64	0.44	18.20	0.62	0.49
France	15.85	0.61	0.38	19.36	0.61	0.42
Greece	17.71	0.68	0.28	21.77	0.64	0.20
Hungary	25.48	0.84	0.17	24.57	0.71	0.17
Ireland	18.16	0.59	0.38	21.60	0.71	0.19
Israel	-	-	-	22.57	0.69	0.38
Italy	15.66	0.59	0.17	27.48	0.73	0.15
Lithuania	19.29	0.64	0.27	-	-	-
Luxemburg	17.70	0.58	0.26	20.91	0.73	0.29
Latvia	23.81	0.77	0.20	20.30	0.59	0.32
Netherlands	18.38	0.69	0.40	18.50	0.67	0.31
Norway	15.09	0.50	0.38	15.82	0.55	0.49
Poland	23.48	0.82	0.22	23.21	0.79	0.20
Portugal	20.66	0.73	0.15	26.05	0.78	0.16
Sweden	21.39	0.83	0.37	17.10	0.60	0.48
Slovenia	26.89	0.92	0.19	23.08	0.82	0.21
Slovak Republic	22.69	0.74	0.17	32.18	0.79	0.17
United Kingdom	18.23	0.57	0.39	17.57	0.53	0.37

* see text for the definition of the variables

Appendix 2: Robustness checks (see text for definition of variables)

Table A4. Participation to higher education and educational inequality. Unweighted estimation.

	EU-SILC	ESS
correlation	-0.43	-0.34
sig.	.000	0.003
regression		
constant	0.52	0.53
λ_k	-0.15	-0.13
$p(\lambda_k)$	0.004	0.02
R^2	0.19	0.12
obs	72	72

Table A5. Participation to higher education and returns to higher education (prestige score)*. Unweighted estimation.

	EU-SILC	ESS	EU-SILC	ESS
correlation	-0.61	-0.70		
sig.	0.001	.000		
regressions:	model 1		model 2	
constant	22.9	26.1	21.9	28.7
θ_k	-6.6	-8.5	-9.7	-6.0
$p(\theta_k)$	0.003	0.001	0.003	0.04
S			4.0	-9.4
p(S)			0.13	0.14
R^2	0.38	0.49	0.44	0.52
obs	24	24	24	24

Table A6. Participation to higher education and returns to higher education (access to the service class). Unweighted estimation.

	EU-SILC	ESS	EU-SILC	ESS
correlation	-0.50	-0.61		
sig.	0.01	0.002		
regressions:	model 1		model 2	
constant	0.73	0.75	0.73	0.71
θ_k	-0.22	-0.16	-0.21	-0.20
$p(\theta_k)$	0.006	0.00	0.02	0.002
S			-0.00	0.17
p(S)			0.99	0.26
R^2	0.34	0.37	0.37	0.39
obs	24	24	24	24

Table A7. Participation to higher education and returns to higher education (prestige score), by gender, cohort 1966-1975

	EU-SILC		ESS	
	men	women	men	women
correlation	-.61	-.67	-.75	-.67
sig.	.0002	.000	.000	.000
regressions:				
constant	22.5	24.7	28.2	27.8
θ_k	-7.0	-8.5	-12.5	-10.3
$p(\theta_k)$	.006	.0009	.000	.004
R^2	.37	.45	.57	.44
obs	24	24	24	24

Table A8. Participation to higher education and returns to higher education in terms of probability of being employed, by gender, cohort 66-75

	EU-SILC		ESS	
	men	women	men	women
correlation	-.58	-.44	-.28	-.17
sig.	.003	.03	.18	.42
regressions:				
constant	.35	-38	.38	.36
θ_k	-.25	-.13	-.20	-.08
$p(\theta_k)$	.01	.06	.31	.48
R^2	.33	.20	.08	.03
obs	24	24	24	24

Table A9. Participation to higher education and returns to higher education (prestige score), controlling for gender and parental background, cohort 1966-1975

	EU-SILC	ESS
correlation	-.71	-.70
sig.	.000	.000
regressions:		
constant	14.2	25.3
θ_k	-7.1	-9.3
$p(\theta_k)$	.00	.001
R^2		.49
obs	24	24