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PARTICIPATION, EQUALITY OF OPPORTUNITY AND RETURNS TO TERTIARY EDUCATION IN CONTEMPORARY EUROPE

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ABSTRACT: The aim of the paper is to investigate the consequences of the expansion of higher education on two goals of the education system, namely promoting equity of educational opportunities and providing credentials that facilitate the matching of labour supply and demand. The first goal is typically studied by research on inequality of educational opportunity; 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 possibly opposite effects on the two goals. (a) If, with educational expansion, equality of educational opportunities increases, while the occupational value of the titles decreases, one has a trade-off scenario. For example, 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 the expansion of higher education, and the returns of higher education degrees decline, one has then a worst-off scenario. (c) 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 five merged waves of the European Social Survey (2002–2010), covering 23 countries.
Key words: tertiary education; inequality of educational opportunities; returns to education

1. Introduction

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

However, to the best of our knowledge, no study has made a direct and explicit attempt to link the two questions together in a large comparative study.[1] This is precisely the contribution of the present paper. Our key idea is that the level of participation in tertiary education (its 'vertical stratification', see Allmendinger 1989) can have different and possibly opposite implications for two aforementioned goals of the education system.

a) If wider access to tertiary education is associated with equalisation (i.e., with more equality of educational opportunities), but also with a lower occupational values of the titles (i.e., with the inflation of credentials), one has a *trade-off* scenario.
b) If wider access does not go together with equalisation, and the returns to higher education degrees are lower, one has then a *worst-off* scenario.
c) Finally, if wider participation is associated with more equality of opportunities and educational returns are similar, one has a *best-off* scenario.

The aim of the paper is therefore to establish which of these scenarios best fit 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 we limit ourselves to the measurement of the observed association between the two phenomena and the size of tertiary education. Moreover, we focus only on occupational returns to education and do not consider, besides income, other types of returns to education, such as health and happiness (Hartog and Oosterbeck 1998) or civic participation (Milligan *et al.* 2004). Still, our descriptive findings that compare inequality of educational opportunities and occupational returns to

1. For an analysis of the Finnish case, see Kivinen *et al.* (2007).

education can have important policy implications. In particular, 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, covering 23 EU countries. The structure of the paper is as follows: in the next section we examine the theoretical underpinnings and empirical evidence available for 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 describe the research design and data and variables used in the empirical analysis. Measurement errors in the two surveys are also discussed at some length. In the fourth section we present our results and in the last section we draw our conclusions.

2. Inequality of educational opportunities and educational returns: three scenarios

Despite the abundance of research on IOE and IOO, both over time and in comparative perspective, it is not easy to provide a clear and unambiguous summary of the results of comparative research on these topics (but, for recent work, see Breen and Jonsson 2005). There are important differences in how the key variables are measured, and in how underlying processes are conceptualised. Inequality of social positions can be analysed in terms of income, following economists of education, or in terms of occupational class or prestige, following sociologists. Education can be measured by the number of years of schooling completed or by the title achieved, and in the latter case one has to cope with the notorious problem of harmonising different national school designs. There are also relevant discrepancies in the way that 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.

Notwithstanding these differences, the most recent studies using relative measures of inequality suggest that IOE has declined over time in most EU countries, alongside an increase in participation in education. The same finding has been produced by comparative research restricted to tertiary education (Arum *et al.* 2007). A recent comparative study also finds a negative relationship between IOE, measured in absolute terms, and the level of industrialisation and expenditure in education (Van Doorn *et al.* 2011). It is thus possible to say that, contrary to the results of previous comparative research (Shavit and Blossfeld 1993), the available evidence points to a decline in IOE (Breen *et al.* 2009; Ballarino *et al.* 2009). However, controversies still exist concerning the extent of this process, the causal mechanisms 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; Pfeffer 2008; Ballarino and Schadee 2010).

With regard to educational returns on the labour market, studies focussing on the USA point to a widening wage gap between individuals who hold a college degree and those who do not. This gap has been explained in terms of the so-called skill-biased technological change (SBTC) hypothesis (Acemoglu 2002). It is thus argued that the evolution of technology, driven by market competition, allows employers to substitute the jobs of poorly educated workers with machines, thus raising productivity and worsening the market situation of those with lower levels of education. 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 products and services in an increasingly competitive economy. Instead, the research on returns to education in Europe has been driven by the notion of the inflation of educational credentials (Collins 1979, 2000; Goldin 1999). As with the circulation of money, an increase in the number of higher education titles in the population, associated with increasing participation, reduces the signalling value of the titles to employers and returns to education thus decrease.

For many European countries a decline in the association between education and social class of destination has been reported (Jonsson 1996; Breen and Goldthorpe 2001; Vallet 2001; Bernardi 2003; Ganzeboom and Luijkx 2004). In a study on 12 EU countries, Gangl (2003) also reports a negative association between the expansion of tertiary education on one side and the quality of the first occupation upon entry to the labour market, measured both as prestige score and social class.

We can now come back to three societal scenarios for the association between high participation in university education, equality of educational opportunities and occupational returns to education, that were briefly sketched in the introduction. The first row of Table 1 depicts a *trade-off scenario* at the societal level, where, with higher participation in tertiary education, equality of opportunity is higher (equalisation: Breen *et al.* 2009), while the occupational values of the titles is lower (credential inflation: Collins 1979). This is a situation in which access to tertiary education is more equal with respect to social background, while tertiary

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***

education loses value as a sorting mechanism in the labour market. Note that we do not claim that high participation in tertiary education is the causal force underlying variation both in IEO and IOO. It might well be that a reduction in IEO fosters educational expansion rather than vice versa. If, for instance, for whatever reason IEO declines and the attendance rate of the lower class grow more than that of the upper class, this would also translate into an overall increase in attendance rate, i.e., into educational expansion. We argue, rather, that under specific conditions educational expansion mediates the macro relationship between IEO and IOO. These specific conditions are that the reduction in IEO comes about with an increase in participation in education of the lower classes and not with a reduction of the upper classes. Second, as far IOO is concerned, that the increase in the supply of tertiary educated people is not over-stripped by an increase in the demand of highly qualified workers. Under these conditions high participation in tertiary education would become the pivotal macro outcome of the trade-off between IEO and IOO.

In the scenario summarised in the second row of the table, equality of opportunities is stable (persistent inequality: Shavit and Blossfeld 1993; Pfeffer 2008), while occupational returns to education are lower, despite larger participation in tertiary education. We would define this as a *worst-off scenario* because neither of the two goals of the education system (equalisation and efficient matching in the market) are then achieved. Finally, in the third row we have a more optimistic scenario, where with lower stratification of tertiary education, equality of opportunities also increases and returns do not diminish, or even increase (SBTC theory: Acemoglu 2002). This is of course our best-off scenario and the two goals of the education system could go hand in hand.

3. Data and variables

In order to investigate these scenarios, we have performed an identical analysis of two parallel data sets: (i) the European Social Survey (five waves 2002–2010) and (ii) the module on intergenerational transmission of poverty in EU-SILC (2005). As noted by Firebaugh (2008: 106) identical

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	0.10	0.18	−0.08	0.10	0.19	−0.09	0.12	0.23	−0.11
Belgium	0.29	0.31	−0.02	0.34	0.35	−0.01	0.43	0.46	−0.03
Czech Rep.	0.11	0.1	0.01	0.14	0.15	−0.01	0.12	0.14	−0.02
Germany	0.32	0.43	−0.11	0.32	0.42	−0.10	0.31	0.38	−0.07
Denmark	0.43	0.26	0.17	0.46	0.28	0.18	0.52	0.33	0.19
Estonia	0.34	0.29	0.05	0.39	0.29	0.10	0.38	0.29	0.09
Spain	0.15	0.17	−0.02	0.21	0.25	−0.04	0.31	0.38	−0.07
Finland	0.32	0.29	0.03	0.41	0.37	0.04	0.50	0.44	0.06
France	0.24	0.18	0.06	0.27	0.24	0.03	0.41	0.38	0.03
Greece	0.11	0.15	−0.04	0.13	0.22	−0.09	0.19	0.28	−0.09
Hungary	0.19	0.14	0.05	0.17	0.15	0.02	0.21	0.17	0.04
Ireland	0.27	0.18	0.09	0.35	0.23	0.12	0.48	0.38	0.10
Italy	0.10	0.12	−0.02	0.10	0.12	−0.02	0.16	0.17	−0.01
Luxembourg	0.18	0.16	0.02	0.18	0.15	0.03	0.29	0.26	0.03
Latvia	0.29	0.18	0.11	0.28	0.19	0.09	0.26	0.2	0.06
The Netherlands	0.25	0.3	−0.05	0.28	0.33	−0.05	0.32	0.4	−0.08
Norway	0.37	0.28	0.09	0.38	0.3	0.08	0.50	0.38	0.12
Poland	0.12	0.11	0.01	0.14	0.13	0.01	0.22	0.22	0.00
Portugal	0.08	0.1	−0.02	0.09	0.12	−0.03	0.15	0.15	0.00
Sweden	0.30	0.29	0.01	0.31	0.28	0.03	0.37	0.37	0.00
Slovenia	0.19	0.07	0.12	0.25	0.13	0.12	0.28	0.19	0.09
Slovakia	0.16	0.16	0.00	0.17	0.17	0.00	0.17	0.17	0.00
United Kingdom	0.27	0.29	−0.02	0.33	0.34	0.01	0.35	0.39	−0.04

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 Table 2 later for the complete list) that have taken part in both ESS and EU-SILC. For the analysis of IEO we analyse three birth cohorts: 1946–55, 1956–65 and 1966–75. 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 to 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. For this reason, in this second part of the analysis we focus only on the youngest cohort, those born between 1966 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.[2] 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 between 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 SIOPS prestige score (Ganzeboom and Treiman 1996) for the current occupation or the most recent occupation for those who were not employed at the time of the survey. This is a continuous hierarchical scale, with scores that range between 12 and 78. As a robustness check, we also use the probability of entering the EGP service class as an alternative measure of occupational attainment. In this case, 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. Finally, the proportion that has achieved tertiary education in each birth cohort in a given country is considered as an indicator of the 'vertical stratification' of a given education system.

There are two important differences in the measurement of these variables in the EU-SILC and ESS surveys. Firstly, in EU-SILC education is measured along a simplified version of the ISCED 97 classification that distinguishes six levels of education. In the ESS, the measurement of education is more precise and an extensive effort has been made to harmonise the classification of education across countries and waves. Moreover, the original country codings are available in the distributed file, and it is thus possible to check the recoding performed in order to harmonise the national codings. We extensively used work already done on this by Schneider (2010), following her recoding proposals for the countries for which they were available. However, no detailed description of the procedures used in the various countries is available for EU-SILC (Schneider and Müller 2009: 2). Country differences in coding procedures are 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%) in six out of 23 countries, with lower figures for tertiary education in the ESS in Austria and Germany, and higher ones in Denmark, Ireland, Latvia, Norway and Slovenia. Thus, the differences between the two surveys do not seem 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

2. Higher education could also be defined in a less restrictive way, also including 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.

variables is insensitive to the different coding procedures in the two surveys.[3]

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-digit codes. The prestige scores in EU-SILC are averages of the more detailed scores provided by four-digit codes within each two-digit group. Accordingly, measurement of prestige is less precise and there is less variation in the distribution of prestige scores in EU-SILC than in ESS.

3.1 The research strategy

Our analysis consists of two steps. In the first step, we extract social origin effects[4] 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. 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 and Cheung 2007). It has been shown that this type of two-step approach is particularly appropriate when a large number of observations at level 1 are nested in a low number of observations at level 2, as is the case in our analysis. Under these circumstances, the more simple and flexible two-step approach performs as well as the more complex simultaneous hierarchical linear models (Lewis and Linzer 2005).

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:

$$t_{ik} = \alpha + p_{2ik}\delta_{2k} + p_{3ik}\delta_{3k} + g_{ik}\gamma_k + u_{ik} \tag{1a}$$

3. 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, $A = \alpha + \varepsilon$. If the same ε applies to the parental education and B is the observed parental education and β the true one, then $r(A, B) = r(A-\varepsilon, B-\varepsilon) = r(\alpha, \beta)$.
4. According to the aims of the paper, we use the term 'effect' in a descriptive sense, without postulating causality.

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 δ_{3k}, which 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 69 cohorts by country clusters (three birth cohorts by 23 countries), we get 69 δ_{3k}. The sample size of each cluster is 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 precise using the former.

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:

$$d_{3k} = \omega + T_k\lambda_k + \varepsilon_k \tag{2a}$$

Where T_k is the proportion of subjects who have achieved higher education in the cohort by country k. Following King (1997: 290), estimates of Equation (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. In this way, greater weight is given to observations with more precise estimates of IOE (d_{3k}). Standard errors are clustered by country. The coefficient λ_k in Equation (2a) expresses the expected variation in the advantage in achieving higher education for those coming from highly educated families associated to a 1% 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 the proportion of attainment of tertiary education T_k approaches 0 or 100% (Lucas 2009). In fact, if nobody or at the other extreme everybody achieves a given level of education, any type of inequality is driven to 0. In the data under analysis, however, T_k varies between a minimum of 7% and a maximum value of 52%, values that are far from a full saturation.

In order to look at within-country change, we have also pooled within-country change-scores in attendance rates and in the δ_{3k} coefficients expressing IEO. We have then estimated first differences models and regressed changes in the 46 δ_{3k} coefficients between two subsequent cohorts of a given country on the corresponding differences in attendance rates in the same two cohorts:

$$\Delta d_{3k} = \omega + \Delta \mathrm{T}_k \xi_k + \tau_k \tag{3a}$$

In the case of IOO, the same two-step procedure is followed, but the analysis is restricted to the 1966–75 cohort, because of the data limitations mentioned earlier. 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

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

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 to tertiary education when compared to lower secondary education in each cohort and country cluster k. Given that we consider only the youngest birth cohort in each country, Equation (1b) produces 23 estimates of β_{3k}. When y_{ik} is the prestige score we use OLS regression, while when y_{ik} is the probability of 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:

$$b_{3k} = \omega + \mathrm{T}_k \theta_k + \upsilon_k \tag{2b}$$

where b_{3k} are the estimates 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 to control for the demand of higher educated people on the part of the economy. As a measure of demand, we use the proportion S_k of individuals that in country k is employed in the professional and managerial class (EGP I and II), and we estimate:

$$b_{3k} = \omega + \mathrm{T}_k \theta_k + \mathrm{S}_k \sigma_k + \upsilon_k \tag{2c}$$

In both macro-equations we use weighted least squares, as for regressions (2a) and (3a).

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 Equations (1a) and (1b), respectively. These being linear probability or OLS models, we then use absolute measures of inequality, instead of relative measures, such as the odds ratios that are still the cornerstone of much of the social mobility and educational inequality research (Breen 2004). There are, however, three reasons for using linear probabilities models and absolute measures of inequality.

First, there are claims that more attention should in general be paid to explain absolute measures of social mobility and inequality (Breen 2004). 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 from logistic regressions that in practice are almost equivalent to the coefficients of the linear probability models that we do estimate. Third, the key reason for using relative measures of inequality, such as odds ratios that are insensitive to differences in the marginal distribution of education and occupation, does not seem to apply here. On the contrary, we are actually interested in how variations in the distribution of tertiary education affects IEO and IOO; we are specifically 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 considering the probability of access to the service class (class I–II in the EGP class scheme); (c) we have performed the analysis on IOO separately for men and women, to limit the possibility of a sample selection bias among women; (d) we measured employment returns to tertiary education (IOO) in terms of employment probabilities, also separating men and women; (e) we measured the occupational returns to tertiary education in comparison to upper secondary instead than to lower secondary; and (f) we have controlled for family background in the

TABLE 3. Participation to higher education and educational inequality; correlation and linear probability model

	EU-SILC	*ESS*
Correlation	−.32	−.35
Sig.	.00	.00
Regression		
Constant	.50	.56
Size of tertiary education (λ_k)	−.12	−.16
Sig.	.016	.022
R^2	.10	.12
Obs	69	69

analysis of returns to education.[5] All these complementary analyses point to the robustness of the findings that we now turn to discuss.

4. Empirical results

In this section, we comment on the results of the second step 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.[6]

Table 3 presents the results of the analysis of the association between inequality in achieving tertiary education and the proportion of tertiary educated in each of the 69 cohort-by-country clusters we observe. The estimates based on the identical analysis of the two distinct data sets are highly consistent. The correlation turns out to be equal to −.32 according to the EU-SILC estimation and −.35 according to the ESS estimation. Following a standard interpretation, the magnitude of these correlations is moderate (Cohen 1988), as confirmed by inspection of the scatterplots reported in the online Appendix (Figures A1–A2). Still, we do find that a higher proportion of tertiary education is associated with lower inequality by social background. The bottom panel of Table 3 shows the estimates of the λ_k coefficients of the Equation (2a) that quantify this association.

The variable for the size of tertiary education has been rescaled 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

5. Results are presented in the Appendix (Tables A6–A14).
6. 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.

education is at its minimal value, and by adding the estimated λ_k coefficient one gets the expected advantage when the size of tertiary education is at its maximum.[7] According to the EU-SILC estimate, this advantage is .50, meaning that those coming from a tertiary educated background have a probability of accessing tertiary education that is 50% higher than for those coming from a less educated background. This advantage declines to 38% when tertiary education is at its highest value. One can then focus on the highest and lowest values for participation in tertiary education observed in our samples: in the case of EU-SILC, the highest value is .46 for the cohort 1966–75 in Belgium, while the lowest is .07 for the cohort 1946–55 in Slovenia. In the latter case, when participation in tertiary education is at its minimal observed value, those coming from a tertiary educated background have a probability of accessing tertiary education that is 50% higher than for those coming from a less educated background, while in the former case the advantage is about 38%: a reduction of slightly more than one-quarter in our IEO measure. In the case of the ESS data, the reduction is slightly higher.

Next, we have estimated first-differences models for the pooled within-country change-scores in attendance rates and in the coefficients expressing IEO. The coefficients in Table 4 refer to the effect of changes in attendance rate from one cohort to the next (i.e., educational expansion) on changes in IEO. The findings are in this case more mixed. For EU-SILC one finds a negative, although statistically not significant, association, meaning that the larger the increase in attendance from one cohort to the other, the greater the reduction in IOE. Such a negative effect is, however, not confirmed in the ESS data where one finds a close to zero

TABLE 4. Change in participation to higher education and in educational inequality; first-order differences model

	EU-SILC	*ESS*
Constant	.05	−.04
Change in tertiary education (ξ_k)	−.90	.11
Sig.	.20	.80
R^2	.07	.00
Obs	46	46

7. The 0/1 rescaling does not affect the results, but it just restricts the interpretation to the actual observed values. This allows avoiding a problem related to our use of the linear probability model: without rescaling, indeed, the model would have predicted an illogical value for the constant. The results for the regressions without rescaling of the independent variable are presented in Appendix (Table A4). In both data sets a one-percentage-unit change in size of tertiary education gives a change in IEO of about 0.3 percentage units.

but positive effect. We also considered different specifications, as adding a term for the level of attendance in the previous cohort or a quadratic term of the change in attendance rates, but none of these different specifications really changes the coefficients, pointing to clear-cut and consistent effects of expansion, however defined, on changes in IOE.[8]

There is no straightforward explanation for this discrepancy between the cross-sectional analysis, with consistent results in the two data sets, and the dynamic analysis, with mixed evidence. Looking at Table 2, one might note that most of the variation in attendance rates occurs across countries and not within countries. For instance, for the cohort 1966–75 (ESS data) one finds a 40-percentage point difference between the country with the highest (Denmark) and lowest (Austria) attendance in tertiary education, while the largest within country variation between the first and last cohort is 16 percentage points (Spain).

This suggests that the relevant expansion for the reduction in IOE might have taken place in the most equal countries before the cohort 1946–55, where our observation window starts. Although in the majority of the countries the more recent cohorts have experienced some educational expansion when compared to the previous one, much of the country differences in IOE are already traceable back to the 1946–55 cohort and have not varied much since then.[9] Much of the comparative story on IOE differences across countries seems to have been written before the cohorts considered in this paper, as suggested by the findings from previous comparative research showing that most of the reduction in IOE has occurred for the cohorts born in the first decades of twentieth century, while not much change is found across the cohorts born after WW2 up to the 1970s (Breen *et al.* 2009: 1496).

Next, we present the results for the analysis of educational returns. In this case we focus only on the most recent cohort, and therefore the N is reduced to 23. The top panel of Table 5 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. Scatterplots for this correlation are to be found in the online Appendix (Figures A3–A4).

Both in the ESS and EU-SILC we find that the returns to tertiary education are smaller in those countries where tertiary education is more diffuse. As for the first macro-analysis of inequality in achieving tertiary education, the correlation coefficients turn out to be almost identical in

8. Results are available on request from the authors.
9. A formal analysis confirms this point, showing the explained variance of participation to higher education between countries to be about two times (in EU-SILC) and three times (in ESS) the corresponding explained variance within countries.

TABLE 5. Participation to higher education and returns to higher education (prestige score), correlation and OLS regressions

	EU-SILC	*ESS*	*EU-SILC*	*ESS*
Correlation	− .77	− .70		
Sig.	.000	.000		
Regressions:	Model 1		Model 2	
Constant	23.6	27.7	23.3	27.9
Size of tertiary education (κ_k)	− 8.6	− 11.1	− 9.0	− 10.0
Sig.	.00	.00	.00	.03
Size of service class (σ)			.70	− 1.5
Sig.			.84	.70
R^2	.59	.48	.59	.49
Obs	23	23	23	23

the two separate estimations. In this case, however, the magnitude of the negative correlation between educational returns to tertiary education and size of tertiary education is higher, at − .77 in EU-SILC and − .70 in ESS.[10] The bottom panel presents the κ_k estimates based on the (2a) OLS regressions. As in the IEO pooled analysis, T has been rescaled so that its minimal value is equal to 0 and its largest value is equal to 1. The effect of the constant refers then, to educational returns with a minimal size of tertiary education, while the effect of T expresses how the returns to tertiary education vary when one passes from the smallest to the largest value for the size of tertiary education.[11] Model 1 shows that the advantage secured by tertiary education when tertiary education is at its lowest values accounts for about 24 and 28 prestige points in the EU-SILC and ESS data sets, respectively. However, where tertiary education is at its maximal diffusion, this advantage reduces in a similar way: by about 36% in EU-SILC (i.e., 8.6/23.6) and 41% in ESS (i.e., 11.6/27.7).

More substantively, if one focuses on the ESS estimates, Austria, the Czech Republic, Italy, Greece, Portugal and Slovakia are the countries with the lowest level of tertiary education (below 20%), while Finland, Norway and Sweden are the countries with largest proportion, at close to 50% (see Table 2 earlier). 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 about 17 points (according to the ESS estimates). A distance of 28 prestige points corresponds, for instance, to a situation where those with tertiary

10. If one changes category of reference, substituting upper secondary education for lower secondary, the correlations are a bit lower, at − .45 (ESS) and − .43 (EU-SILC). See Appendix Table A13.
11. The regressions without rescaling are presented in Appendix Table A5. In this case the coefficients are, quite curiously, identical at − 27.1 for both data-sets.

education access professional positions (ISCO code 2000, with average prestige equal to 70) and those with lower secondary education access shop and market sales occupations (ISCO code 5000, with an average prestige of 40). However, 17 points correspond to the distance between the latter and lower level 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 also takes 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,[12] the model shows that after controlling for the demand for highly qualified employment, the negative association between the size of tertiary education and educational returns persists. The estimates for S, in fact, are close to 0 and are not statistically significant at conventional levels, in either analysis.

When the probability to enter EGP I–II is used as an alternative measure of the quality of job, the results (reported in the Appendix, Table A9), from both Models 1 and 2 are quite similar to those found using the SIOPS prestige score and presented earlier.

5. Conclusions

It is now possible to come back to the three macro scenarios that we described above and to discuss them in the light of the evidence presented in the previous paragraph. At the cross-sectional level we found a negative correlation between the level of participation in tertiary education and the level of inequality in achieving a tertiary degree, and we also found a negative correlation between the level of participation in tertiary education and occupational returns of tertiary education. Both associations have been validated by a parallel analysis of independent data sets, and they are robust to a large battery of sensitivity checks. The dynamic analysis of first differences across cohorts for IOE leads to more mixed results. A negative association between variations in attendance rate and IEO is found for EU-SILC, while a tiny close to zero effect is found for ESS. Neither of the effects turns out to be statistically significant.

12. 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.

Why then one observes a negative association across countries (robust to replication on separate data sets), while no clear result is found in first differences models? We speculate that much of the country differences in IOE are already traceable back to the 1945–56 cohort and have not varied much since them. We then observe association in levels, but our data are left-censored with regard to the *changes* in IOE and attendance rates that have brought those associations already for the cohort 1945–56. This interpretation is line with other studies that have compared a larger number of cohorts.[13]

Overall, our evidence seems to point towards a *trade-off scenario*: in countries with a larger participation in tertiary education there tend to be a smaller social background inequality but also smaller returns to tertiary education. One might even interpret the negative correlation found for occupational returns and the zero effect found for the first differences analysis in the ESS as partial support for the *worst-off* scenario depicted in Table 1, in which the decline in returns turns out to be larger than the gains in equality by social background. One should note that our cross-sectional and first-differences analyses are ill-equipped to provide a stringent test for the dynamics of educational expansion and its consequences for IOE and IOO. One major limitation is that of reverse causality between participation in tertiary education and IEO. As we have argued above, while in principle a reduction in IEO might come about without an increase in attendance rates, it seems reasonable to assume that a reduction in IEO will also imply an overall increase in tertiary education participation. The causal links underlying the trade-off scenario would then run from IEO to expansion and then from expansion to credential inflation. One would then need a finer grained analysis to uncover the underlying dynamics of the cross-sectional trade-off established in this paper. One possibility would be to focus on educational reforms that increase the compulsory age of educational attendance. By means of a regression discontinuity design one might then consider the educational expansion induced by the reform as truly exogenous and study its combined effect on IOE and IOO.

Although one might want to wait for such type of study in order to draw firm implications for policy initiatives, the cross-sectional negative association between tertiary educational attendance and occupational returns established in this paper may warrant at least some caution with regard the benchmark of 40% tertiary education in the population of each

13. ESS allows in fact, to also observe the cohort born in the 1920s, and if the country difference in tertiary participation between this cohort and the last one is regressed on the corresponding difference in IEO, the coefficient turns out to be negative. Results are available on request from the authors.

country set by the EU Commission's ET 2020. According to this result, and leaving aside other possible returns to education outside the labour market, it is by no means certain that this kind of investment will actually 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 horizontal stratification within tertiary education, with titles released from elite universities becoming much more valuable than others. Further vertical differentiation within tertiary education might also develop between Bachelor's, Master's and doctoral qualifications. Finally, the decrease of the signalling value of educational titles in the labour market could also produce an increase in the occupational value of non-cognitive skills that are not transmitted via education, but rather in the realm of the family, thus reinforcing the intergenerational reproduction of existing inequalities (Goldthorpe 2007).

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Appendix

(available upon request or from the first author's webpage)