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Inequality at the top. Educational expansion, financial constraints and opportunities of university graduation by social origin

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ABSTRACT

There is evidence that the increase of educational and social mobility that characterised the middle decades of the twentieth century slowed down at the turn of this century, in spite of persistent expansion of higher education. At the same time, income inequality and welfare retrenchment increased. Applying a two-stage design to a merge of individual level-data from the PIAAC-Survey of Adult Skills (OECD) and country-level data on educational expansion, income inequality and regime of higher education finance drawn from different sources, we test the relative importance of these three factors in the explanation of equality of opportunities of university graduation by social origin. We select individuals who were 25–45 years old in the survey year. Our two-stage design shows a negligible role of higher education expansion, whereas income inequality and the regime of higher education finance are more consequential in explaining cross-national differences in opportunities of university graduation by social origin. Inequality of university graduation by social origin is significantly increased with income inequality and reduced in systems of tertiary education characterised by low fees and high subsidies provided to students.

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1. Introduction

Skill-biased technological change, the transition from manufacturing to service economies, and increasing female educational attainment have driven an expansion of higher education in high-income countries over the last few decades (Arum *et al.* 2007). Marginson (2016: 416) reports that 'between 1970 and 2013 the world number of tertiary students

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multiplied by 6.12 while global population multiplied by 1.93', and such a trend accelerated in the 1990s. This expansion of higher education has been argued to favour equal opportunities for university graduation by social origin (Shavit *et al.* 2007; Breen *et al.* 2009; Meraviglia and Buis 2015). Yet, there are two reasons why the expansion of higher education may not have been as effective in reducing educational inequality as is desirable. First, expansion of higher education has been associated with a process of increasing horizontal differentiation (Arum *et al.* 2007) that may have derived from students from a socioeconomically more advantaged origin being more able to attain a qualitative advantage, identifying and getting access to the more promising educational programmes or institutions (Lucas 2001, 2009). Second, even considering a purely vertical dimension of higher education, national-level factors related to the costs of higher education and the capacity of families or individuals to afford them can also affect the association between social origin and college graduation, and they have not received much attention. Quite noticeably, the general trend towards equalisation of educational outcomes by social origin that characterised the second half of the twentieth century (the so-called *Trente Glorieuses*) slowed down at the turn of the century, when higher education was still on the rise but welfare retrenchment and increasing income inequality appeared as unfavourable factors for equal opportunities and outcomes (Barone 2019).

In this research, we want to contribute to the literature on equality of educational attainment, first, by revising the role of expansion of higher education and, second, by considering the financial constraints suffered by individuals and families due to income inequality or lack of public financial support for higher education. Our contribution lies in assessing the *relative* importance of these three factors, which have not often been explicitly compared despite being considered drivers of socioeconomic inequality in educational attainment within the literature. In other words, we want to integrate the analysis of these factors in a more explicit way than before. After theoretically reviewing all these factors, we will present the data and methods used for testing the corresponding hypotheses, and we will discuss our main results, derived from a two-stage analysis of our data.

2. Theoretical framework

2.1. Educational expansion

A long and largely unfinished debate on the effect of educational expansion on educational inequalities by social origin started with

modernisation theory, which expected inequalities in access to education and educational attainment to be reduced by wider affluence and investment in public education, an upgrading of the occupational structure, and a process of economic rationalisation that would shift the balance in job allocation from ascription to achievement (Blau and Duncan 1967; Treiman 1970). Empirical evidence initially rejected such a scenario (Shavit and Blossfeld 1993), but more recent evidence, derived from more accurate methods and large national samples, showed a reduction of educational inequalities during the middle decades of the twentieth century (Breen *et al.* 2009; see also Van Doorn *et al.* 2011; Meraviglia and Buis 2015; Barone and Ruggera 2018). The abolition or reduction of fees in primary and secondary education in many countries, the more even distribution of schools or universities across the country, improved travelling conditions, the increase of compulsory school age, and the postponement of tracking would have all contributed to a reduction of the opportunity cost of education for working class families during that period. Such a reduction in the inequality of access to higher stages in the educational trajectory would have induced an equivalent reduction in the inequality of university graduation.

There are reasons why the expansion of higher education, in particular, may have contributed to equal opportunities for college access and graduation. First, as students grow older, it is reasonable to think that educational decisions become increasingly detached from their social origin ('life-course hypothesis'). Second, as working-class students make successive transitions along the educational trajectory, they become more and more selected on the basis of ability and motivation, more and more so than what happens with students from the upper class, so that the explanatory power of social origin is progressively blurred ('selection hypothesis') (Triventi 2013; Karlson 2019). For these reasons, higher education in general, and college degrees in particular, have often been regarded as the 'great equaliser' (Hout 1988). The more individuals arrive at the higher echelons of the educational ladder, the less their decisions would be attached to their social origin, due to the 'life-course' or 'selection' hypotheses mentioned before (Mare 1981; Pfeffer and Hertel 2015; Karlson 2019). An additional reason why the expansion of higher education may increase the equality of college graduation by social origin is that it often entails a more balanced distribution of universities across the territory and thus the provision of universities closer to home, which is surely something of far more importance for students whose families have more limited

economic resources (see Suhonen and Karhunen [2019] for Finland, Oppedisano [2011] for Italy, and Currie and Moretti [2003] for the United States). This leads us to formulate the following hypothesis:

> Hyp. 1: Expansion of higher education is associated with less inequality of university graduation by social origin.

There are other well-known theoretical arguments for being sceptical about the benefits of educational expansion for equality of educational outcomes. Shavit and Blossfeld's (1993) initial findings about the general lack of association between expansion and equal opportunities led to the formulation of the 'maximally maintained inequality' (MMI) thesis, according to which the new opportunities generated by educational expansion are more likely to be enjoyed by the offspring of upper classes, the ones with the resources to seize them (Raftery and Hout 1993; Ballarino *et al.* 2008). Educational expansion would not improve the equality of educational access and graduation by social origin unless a given level of education becomes saturated by members of the upper classes (Barone 2019).

Other 'social reproduction theories' at the individual level support the idea of persistent inequality. For 'cultural reproduction theory', academic performance implicitly rewards conventions, attitudes, cultural consumption, and lifestyles easily nurtured by the middle and upper-middle classes, to the detriment of the working class (Bourdieu and Passeron 1977; Bourdieu 1984). Thus, expanding education means expanding this system of rewards. 'Relative risk aversion' (RRA) offers an alternative, rational-choice explanation of the persistent inequality of educational opportunities (Breen and Goldthorpe 1997). RRA considers the costs, benefits, and probability of reaping the benefits from further educational investments as the real drivers of educational decisions. Different social origins share a common goal of social demotion avoidance, but they make different readings of the costs, benefits, and risks associated with further educational investments. This would explain why these decisions differ across social origin and ultimately explain the persistence of educational inequality mentioned before.

In consonance with MMI theory, Arum et al.'s (2007) analysis of higher education expansion in 15 countries led them to conclude that expansion per se did not lead to a reduction of inequality in the transition from secondary to higher education; only saturation did (see also Bar Haim and Shavit [2013] for countries participating in the European Social Survey, and Boliver [2011] for the United Kingdom). This

theoretical reasoning and empirical evidence would lead to the rejection of the hypothesis formulated above, that is, to the confirmation of its corresponding null hypothesis.

2.2. Income inequality and regime of higher education finance

Quite interestingly, as much evidence was collected of a process of equalisation during the middle decades of the twentieth century as has been more recently collected of a stall in such an equalising trend. Barone (2019) argues that the process of equalisation was not permanent, but something specific to the so-called *Trente Glorieuses* (1945–1973). The cohorts born afterwards, when higher education was still expanding, did not enjoy such an equalising trend. This may have to do with reasons that are not strictly related to educational expansion: growing income inequality and its negative effect on investment in higher education among individuals and households at the bottom of the income distribution, on the one hand, and welfare retrenchment and its effects on public support for higher education, on the other hand (Meraviglia and Buis 2015; Barone and Ruggera 2018; Bernardi *et al.* 2018; Barone 2019).

As for income inequality, evidence of its positive association with inequality in access to tertiary education can be drawn from a number of national case studies. Haveman and Smeeding (2006:, 125) show that rising college prices during the 1980s and 1990s, 'together with growing inequality of family income' and a slower pace of increase of financial aid, put lower-income families in the United States at a growing disadvantage for college entry and completion relative to higher-income families. For Denmark, Thomsen (2015) finds a modest increase in inequality of higher education participation from 1984 to 2010 when looking at parents' *income* instead of parental education. Hansen (1997) finds that parental income is decisive in explaining track choice and the level at which Norwegian youth obtain their university degree. In sum, there is evidence that even in countries with low inequality and generous systems of higher education, parental income is found to be influential in both access to higher education and the level at which students graduate.

Although not as frequent, there is also evidence of an association between income inequality and inequality of university graduation by social origin from cross-national research. Cingano (2014) shows that the higher the income inequality at the country level, the lower the

likelihood of tertiary graduation among those coming from a low educational background. Kogan *et al.* (2012) find something similar for Central and Eastern European countries, which were clearly affected by increasing income inequality after the demise of socialist regimes. With all this evidence in mind, we formulate the following hypothesis:

> Hyp. 2: Countries with higher income inequality show higher inequality in university graduation by social origin.

The scarce literature that has explored the association between income inequality and inequality of educational attainment by social origin so far (Cingano 2014; Kogan *et al.* 2012) does not explore the correcting effect that may come from public financial support for higher education. Ideally, this financial support should cover not only the direct costs (i.e. fees, study materials, transportation costs) but also the indirect ones (delayed earnings). They all may affect inequality in tertiary graduation by social background. Moreover, the subjective perception of these costs may worsen this inequality. For the Italian case, Abbiati and Barone (2007) demonstrate that upper-secondary students overestimate both the direct costs of university and the difficulty of completing university. They do not find a difference in this respect across social groups, but they argue that the 'same absolute bias is more consequential for less affluent families' (Abbiati and Barone 2007, 141).

Subjective and objective difficulties to finance higher education for children from low-income families may be compensated by public financial support (Goldrick-Rab *et al.* 2016). Such support may come in different forms: scholarships, loans, low fees, etc. Summarising them into a single numerical indicator may be a difficult task (Garritzmann 2016; Liu *et al.* 2016). Applying cluster analysis to more than 70 characteristics of systems of higher education in 33 OECD countries, Garritzmann (2016) recently reduced these different sources to two dimensions (subsidies received by students and families, and costs of higher education). To our knowledge, Garritzmann's typology is the only one whose types emanate from an explicit statistical attempt to reduce many dimensions of financial support for higher education. The typology is constituted by four regimes of higher education finance: low tuition and low subsidy (LTLS) (i.e. Germany), low tuition and high subsidy (LTHS) (i.e. Finland), high tuition and high subsidy (HTHS) (i.e. US and other Anglo-Saxon countries), and high tuition and low subsidy (HTLS) (i.e. Japan). It is important to bear in mind that Garritzmann (2016) includes loans with convenient interest rates

among subsidies. Loans have usually been regarded as a way of student financial support because they usually imply 'a financial commitment by the government in the form of subsidised interest payments, guarantees against default (…)', and the award of publicly subsidised loans is usually means-tested (Asplund *et al.* 2008, 267).

Following Garritzmann's typology, we may expect that more generous higher education finance regimes would be associated with lower inequality of graduation at the tertiary level by social origin. In particular, we believe that LTHS and HTLS would occupy the extremes in a continuum of generosity (LTHS being the most generous and HTLS being the least generous), with LTLS and HTHS in the middle. This would be in line with studies that have recently highlighted the role of financial support in helping university graduation among students from disadvantaged backgrounds. Thus, in their review of 71 policy interventions aimed at favouring disadvantaged students' higher education enrolment and graduation, Herbaut and Geven (2020) did not find any clearly positive effect of 'outreach interventions', aimed at improving their access to information, but they did find a positive effect of financial aids when they were sufficiently generous. In sum, we expect that:

> Hyp. 3: Countries with less generous systems of higher education finance will show higher inequality in university graduation by social origin.

3. Research design

3.1. Overview of the analytical strategy

We followed a two-stage estimation strategy. For each cohort by country, we ran a binomial logistic regression and generated the average marginal effect (AME) of achieving a university degree (vs. none) among individuals of high educational origin compared to individuals of low educational origin. In each of the cohort-by-country specific regression models with individual-level data, we controlled for sex and age of respondent in that country. The AME of having a high vs. low educational background became the dependent variable in the second stage. This variable can be understood as a continuous measure of the degree to which university degree attainment is (un)equal in each country.

In the second stage, we estimated the effect that country characteristics have on the inequality of university attainment by means of a random-

effects within-between regression that allows to exploit both the between-country variation in the association of predictors and outcomes and the within-country variation over time in this association. This implies the use of individual-level variables to estimate with individual microdata the inequality of university attainment in each country and the use of variables measured at the country and the country-by-graduation-cohort level to estimate the between-country association and the within-country association with the outcome, respectively.

3.2. Data and analytical sample

We merge country-level data from different sources (see below) with individual-level data drawn from the Survey of Adult Skills developed and implemented by the OECD as part of the Programme for International Assessment of Adult Competencies (PIAAC). We selected this survey for its broad country coverage, the relatively large sample sizes at the country level, especially if we compare it to other international survey projects (e.g. European Social Survey, World Values Study or International Social Survey Programme), and because it provides a harmonised and cross-nationally comparable coding of respondents' and parents' educational attainment based on the 1997 International Standardized Classification of Education (ISCED-97).

The analytical sample of the study includes all respondents aged 25–45 years old at the time of the survey for whom information on educational attainment is available and for whom there are no missing values in any independent variable. Respondents were grouped into two different age cohorts depending on the year when they turned 26 years old. We used this age criterion because 26-years-old is the mean age of graduation from tertiary education of first-time tertiary graduates across OECD countries in the selected age group (25–45) in the years when the Survey of Adult Skills was carried out.[1] Hence, we are assuming that respondents who obtained a university degree (graduate or postgraduate) did so around age 26. The first age cohort is made up of individuals aged 36–45 years old in the moment of the survey and who turned 26 between years 1992 and 2001 or 1995 and 2004 (depending on whether fieldwork took place in 2011/12 or 2014/15).[2] The second age cohort is made up of individuals aged 26–35 years old who turned 26 between 2002 and 2011 or between

[1]As revealed by calculations based on our own analysis of the microdata of the Survey of Adult Skills.
[2]These individuals were born between 1966–75 or 1969–78 depending on the timing of the fieldwork.

2005 and 2014 (depending on the timing of the survey fieldwork).[3] These age cohorts must be considered *university graduation* cohorts.

Among the 34 countries that participated in the PIAAC survey, we selected 28 (see the full time series of variables in the Online Appendix 2). The rest of the countries were excluded due to problems with the coding of educational attainment[4] or to the high number of missing values in the country-level variables. Details about the exclusion of these countries can be found in the Online Appendix 1. The analytical sample size, after restrictions, is made up of 70,045 individuals nested in a maximum of 28 countries, although the number of countries is reduced to 16 in some analysis, depending on the availability of country-level information (see results with the constant-country sample in the 'Results' section for more details).

Since we are interested in how country characteristics influence inequality in university graduation, country variables were measured when respondents in our analytical sample were aged 26. This implies that, for countries where the fieldwork took place in 2011/12, the first year for which we measure country-level variables is 1992 – the year when the oldest respondents, aged 45, were 26 years old – . For these same countries, the last year for which we measure country-level variables is 2011 – the year when the youngest respondents were about to turn 26 – . For countries where the fieldwork took place in 2014/15, country variables were measured along the period 1995–2014.

By setting age 26 as the age of assumed graduation from university and as the age at which we measure country characteristics, we assume that country characteristics influence university graduation when respondents are this age. We also assume that people who do not graduate from university because they left education at an earlier age were exposed to the same contextual characteristics when they left education as those who were assumed to graduate at age 26. More generally, the 25–45 age restriction of the analytical sample is aimed at limiting the degree of unobserved heterogeneity in individual- and country-level characteristics caused by the different time periods in which people were typically assumed to attain a university degree, while at the same time keeping a sufficiently high sample size to get reliable survey estimates. Measuring country characteristics at a year when all respondents had a younger age (e.g. 18 years old) would have implied a loss of available yearly

[3]These individuals were born between 1976–85 or 1979–88 depending on the timing of the fieldwork.
[4]See Schneider (2010) for problems of validity of the ISCED classification for cross-national research. See also Schneider (2018) for assessment of the ISCED classification for the PIAAC study.

data points for some country independent variable and dropping some countries from the analyses.[5]

The period covered in our analysis of PIAAC data (1992–1995–2011–2014) approximates a period in which, during the twentieth century, income inequality had begun increasing while tertiary education kept on expanding. Some of the most well-known analysts of historical trends in income and wealth inequality point to the last decades of the twentieth century as constituting a new era in the historical evolution of inequality (Piketty and Zucman 2014; Alvaredo *et al.* 2017; Milanovic 2022). Piketty and Zucman (2014) demonstrate that throughout the twentieth century there was a U-shaped trend in private wealth-income ratios in rich countries. Such a ratio subsided in the middle decades of the century, raising again from the 1970s onwards. Looking at global income inequality from 1820 to 2018, Milanovic (2022) defines three 'eras' (1820–1950, 1950–1980, 1980–2018); the last one characterised by decreasing between-country income inequality (mostly due to rising incomes in countries like China and India) and increasing within-country inequality.[6] According to Milanovic (2013:, 202), the biggest 'losers' of these recent changes in global income distribution, from the 1970s onwards, apart from the poorest in poorest nations, are the groups that he labels as the former 'global upper middle class', among which he includes 'those citizens of rich countries whose income has stagnated'. It is reasonable to think that this trend may have had an impact on intergenerational educational mobility.

Unlike this more changeable evolution of income inequality throughout the twentieth century, the evolution of higher education, as measured by gross enrolment in tertiary education[7], reveals a steady increase from the 1970s onwards. If anything, expansion of tertiary education as

[5]We chose age 26 as a common age to measure country-level variables because it is the average age of first graduation from tertiary education across the OECD countries in our analysis. We had to make a compromise about graduation age that works for all countries because using different graduation ages for each country would have resulted in comparing different time periods for each country. We believe assuming a common graduation age for all countries does not have severe implications for our results. Each graduation cohort covers several years, and the country-level variables are averaged for all the years included in each graduation cohort. This entails that inaccuracies in assigning a country value to an individual based on the assumed age of graduation can be compensated by averaging country values across years as far as those years belong to the same graduation cohort as the one we assume the individual belongs to.

[6]This evolution of income inequality in rich countries, and the recent change from the late 1970s onwards, can be graphically represented in the "Within-country inequality in rich countries" offered by Our World in Data: https://ourworldindata.org/income-inequality#within-country-inequality-in-rich-countries, (last consulted: January 5th. 2023).

[7]Calculated for the 18–23 age group, the gross enrolment ratio in higher education is the ratio of enrolment in higher education to the population in the eligible group.

measured by this indicator (see Figure A1 in the Appendix) seems to have sped up at the turn of the century, which is the moment when other scholars have perceived a stagnation of the increase of equality of educational opportunities. In sum, during these decades, educational expansion continued while income and wealth inequality, which had subsided or stabilised during the middle decades of the twentieth century, had begun increasing too. These two facts confirm the intuition, previously formulated by other scholars (Meraviglia and Buis 2015; Barone and Ruggera 2018; Bernardi *et al.* 2018; Barone 2019), that the coincidence of increasing income inequality and persistent educational expansion characterised the turn of the last century. It raises interest in looking at the last decades of the twentieth century for *jointly* analysing the effect of educational expansion and income inequality on the equality of tertiary graduation by social origin as a period of analysis. This period is reasonably close to the period covered in our analysis with PIAAC data, as close as PIAAC data availability allows (see above).

3.2. Variables

3.2.1. Individual-level variables

The dependent variable at the individual level is the attainment of any tertiary academic/general educational diploma versus the attainment of a diploma from vocational tertiary education or any educational diploma that is below tertiary education, according to the ISCED-97 classification. We coded as having a *university diploma* any respondent declaring to have as highest formal qualification a bachelor degree (ISCED 5A) or a master/research degree (ISCED 5A/6). We coded as having *less than a university diploma* any respondent declaring to have as highest formal qualification a professional degree (ISCED 5B) or any diploma below this level (post-secondary, no tertiary [ISCED 4A-B-C]; upper secondary [ISCED 3A-B, C long]; lower secondary [ISCED 2, ISCED 3C-short]; primary or less [ISCED 1 or less]).

This variable captures an inequality that goes beyond access to university; it is an inequality of educational outcomes[8] (university graduation). It covers the possible effect of socioeconomic background in both access to university and progression up to graduation (or, conversely, in the risk of dropout). Indeed, some of the key independent variables (i.e. public

[8]For a reflection about the differences between inequality of opportunities and inequality of outcomes, see Swift (2004) or Breen (2010).

financial support for higher education or income inequality) are mechanisms through which social background may have an impact all along the undergraduate's student trajectory, from access to graduation.

To measure educational origins, we used the highest level of education achieved by the respondents' father measured using ISCED 97, with three possible categories: (i) low educational origins: ISCED 1/2/3-short; (ii) medium educational origins: ISCED 3/4; (iii) high educational origins: ISCED 5/6. We chose parental education as a proxy of social origin, first, because it is more likely that fathers achieved their maximum education level when respondents were asked about it, whereas this is not so likely for occupation; second, because the recall of parental education is usually more precise than the recall of parental occupation; finally, because there may have been parents who were inactive or unemployed when the interviewees where young but there cannot be parents without a category of educational attainment assigned to them. Moreover, parental education is likely to be more stable than occupation and more likely to be completed by the moment respondents were interviewed. We prioritised father's education to a dominance approach (highest education among parents) because, for several countries in the study, female labour market activity was not as high as male one at the beginning of the period of analysis, so that father's education could have been by then more decisive for parental household income than mother's education. In other words, father's education could proxy better the resources of the parental household than mother's education. This said, we carried out a sensitivity analysis using mother's education to operationalise social origins. The level of inequality in university attainment is very similar regardless of the parent we choose. The association with the main independent variables is also substantively the same regardless of the parent.[9]

3.3.2. Country-level independent variables

The theoretically relevant variables at the country level in the second stage of the analysis are income inequality (two indicators), educational expansion at the tertiary level (three indicators), and a typology of higher education financing.

Income inequality is measured using the Gini coefficient after taxes and transfers (disposable income) for the total population for all available years. Data were obtained from the OECD Income Distribution

[9]Results are available upon request.

Database.[10] We also used the ratio of the first to last quintile of the income distribution (S80/S20) as a measure of income inequality alternative to Gini (data were obtained from the same source).[11] The use of this alternative is justified based on the contrast between the country marginal effects of having a highly vs low-educated father, which works as dependent variable in the second stage of our analysis (see below). These parental education origins could roughly fit with the two categories in the income distribution mentioned above. These two variables were measured for all years with available data between 1992 and 2011 in countries where the fieldwork took place in 2011/12 and between 1995 and 2014 in countries where the fieldwork took place in 2014/15. Then, we computed the average value across all these years for each country (between-country component) and the deviation of the average value across the years in each graduation cohort from the overall country average (within-country component).

Educational expansion at the tertiary level is measured through three indicators. For each of them we computed the overall mean across years by country (between-country component) and the deviation of the mean value of years comprised in each graduation cohort and country from the overall country mean. The first indicator (educational expansion I) is the percentage point (p.p.) difference between the share of individuals with tertiary education in the 25–34 age group and the share of individuals with tertiary education in the 55–64 age group.[12] We proceeded as follows. First, for each country and for each year between 1991 and 2011/1995–2014, we computed the aforementioned difference. Second, we computed the average of the p.p. difference between the two age groups for all the years available and the deviation between the overall country mean and the mean of years comprised in each graduation cohort for each country.

The second indicator (educational expansion II) was computed in a similar way. However, instead of the p.p. difference between the two age groups, we computed the relative difference expressed as the percentage of increase/decrease between the two age groups. We could measure

[10]Gini (disposable income, post taxes and transfers). Income Distribution Database. Retrieved 10 July 2019 from https://stats.oecd.org/Index.aspx?DataSetCode=IDD

[11]S80/S20 disposable income quintile share. Income Distribution Database. Retrieved 1 February 2021 from https://stats.oecd.org/Index.aspx?DataSetCode=IDD

[12]The comparison of the same level of educational attainment in two different age groups as a way of approaching educational expansion is a standard procedure both in international reports (OECD 2013 (Figure c., p. 58), 2015 (Chart A1.2, p. 33) and academic research (see for instance, Müller and Wolbers 2003; Bernardi and Ballarino 2014).

this indicator for years 1991–2011. There is no data available either for years prior to 1991 or for years later than 2011 in the data source used (OECD Factbook, several years).[13] These two indicators provide a measure of the average level of educational expansion occurred in the decades prior to the year when respondents were 26 years old.

The third indicator (educational expansion III) is the proportional change in the gross enrolment ratio in tertiary education between each year included in our time series and the gross enrolment ratio seven years before. For each country and year between 1992–2011/1995–2014 we computed the proportional difference in the gross enrolment ratio in tertiary education between that year and seven years before (or the oldest previous year for which there is data available). We chose the gross tertiary enrolment ratio because it is an indicator of the capacity of the education system to enroll students. As such, it tells what extent tertiary education has expanded in the most recent years. We took as baseline the situation seven years before each year included in the time series because we assumed that around that year students were entering tertiary education and, therefore, was a moment when the influence of educational expansion could be more consequential.

The *regime of higher education finance* is a categorical variable based on Garritzmann's (2016) 'four worlds of student finance ', a typology of higher education finance regimes created on the basis of 12 variables, including the proportion of students not paying tuition fees and the average tuition fees in public ISCED5A higher education institutions. Resorting to cluster analysis of time-series data for 33 OECD countries over the period 1995–2009, Garritzmann identifies four ideal types of finance regimes: (i) high tuition-high subsidy (almost all students pay high tuition fees but a large proportion also receive subsidies), (ii) high tuition-low subsidy, (almost all students pay high-tuition fees and public support to cover them is scarce), (iii) low-tuition-high subsidy (students usually do not pay tuition fees and often receive subsidies, mainly in form of direct grants) and (iv) low tuition-low subsidy (fees are low, but students rarely get financial support for their studies). Garritzman finds that the country patterns of higher education finance remain fairly stable over time. By using this typology, we assume that

[13]The raw data for this indicator was obtained from the indicator "Tertiary attainment for age group 25–64 (as a percentage of the population in that age group)". The data source differs for the different years. For years 1991-2005, data was obtained from the *OECD Factbook 2005. Economic, Environmental and Social Statistics*, page 195. For year 2009, data were obtained from the *OECD Factbook 2012*. For year 2011, data come from the *OECD Factbook 2014*, page 195. Yearly issues of the OECD Factbook can be found here: https://www.oecd-ilibrary.org/economics/oecd-factbook_18147364.

countries belonged to the same ideal type without changes for the whole period 1992–2011/1995–2014. This is a plausible assumption given that the rank-order of countries included in Garritzman's analysis is quite stable over the years he covers in most of the variables on which the typology is based. Since these variables do not vary over time, we can only exploit between-country variation and, as such, we only include the between-country component in statistical models.

Although the limited number of countries in our data does not allow including many controls in the analysis, we considered two: the index of tracking of the education system and the percentage of the GDP spent in research and development (R&D) activities. The index of tracking is a continuous variable created by Bol and Van de Werfhorst (2013). It measures the degree of differentiation of the education system.[14] We could only measure this variable at the country level (not at the cohort x country level) so we only exploit the between-country variation of this variable. We choose to include this variable because the system of education at the primary and secondary levels has often been discussed as one important factor conditioning the opportunities of individuals of different social origin to gain access to higher education. According to the diversion thesis, well-developed training systems may divert students from low social backgrounds from the path leading to university (Hillmert 2003) or offer them an appealing alternative to university at the tertiary level (Becker and Hecken 2008). Indeed, there is evidence that tracking reduces equality of opportunity (Bol and Van de Werfhorst 2013). In the opposite direction, Green and Pensiero (2016) have recently shown that tracking may be sometimes associated with an inequality reduction in skill opportunities and outcomes, especially when *parity of esteem* is attained between academic and vocational tracks. In that case, vocational education may not only appeal students from lower-social background, but also provide them with reasonably good access to some type of higher education, above and beyond what happens in less stratified systems of education (see also Raffe *et al.* 2001).

The second control at the country level, the % of the GDP spent on R&D, is a proxy of the degree of modernisation of the economic structure of the country and of the demand for highly skilled individuals. R&D intensive economies require more highly skilled workers. This could incentivize the investment in higher education due to the employment

[14]The tracking index is based on age of first selection into different educational tracks, number of tracks for 15 years old and proportion of curriculum that is tracked (Bol and Van der Werfhost 2013).

premium that it represents, leading to a relatively higher access of individuals from low educational origins to higher education in countries with more investment in R&D. This could decrease social inequality in access to university. We compute both the average value across all the years of the time series for which there is available data (between-country component) and the difference between each graduation cohort average and the overall country average (within-country component). Data are obtained from the Main Science and Technology Indicators database of the OECD.

3.3. Methods

Multilevel models with relatively low sample sizes at the aggregate level yield non-reliable estimates of country-level effects, variance components and standard errors. These problems are aggravated when the dependent variable is dichotomous (which is our case) and when the modelling specification includes random slopes and cross-level interactions (Bryan and Jenkins 2016). Based on simulations, Bryan and Jenkins (2016) suggest that the minimum orientating number of higher-level units should be 20 for a relatively simple multilevel model with a continuous outcome, random intercepts and no cross-level interactions. If the outcome is binary, the sample size requirements rise to 30 and even more if more complex specifications are used. Since the maximum number of higher-level units, we can use is below this threshold, we decline to apply multilevel techniques. Following Bryan and Jenkins (2016) recommendations for this type of situations, a two-stage design was alternatively applied to our data. In the first stage, an individual-level regression is fitted to each cohort-by-country sample *separately* to estimate the outcome of interest. In this case, educational-origin effects on the probability of university degree attainment in each country. In the second stage, these cohort estimates by country were regressed on cohort-by-country- and country-level variables (educational expansion, income inequality, higher education finance regime, index of external differentiation) to establish their association with the dependent variable and which of them explains a larger share of the variance of the outcome.

In the *second-stage* of the two-step procedure, we apply a longitudinal random-effects within-between (REWB) regression (Fairbrother 2014). A longitudinal REWB model is a statistical model that combines a within-case (longitudinal) fixed effect analysis and a between-case (cross-sectional) analysis. The within-case analysis provides an estimate of the

association between variables from the variation over time within countries controlling for time-constant unobserved heterogeneity. The between-case analysis provides an estimate of the association from the overall variation between countries across waves. This is achieved by including the mean of independent variables over time for each case (between-case component; $\bar{X}$) and the deviation from this mean of the score of each independent variable in each observation time (within-case component; $\overline{X_i} - x_{it}$).

We opted for a REWB model instead of a more standard country-fixed effects model for several reasons. Firstly, a fixed-effects model only uses cases for which there is variation over time in the independent variable to estimate the magnitude of the association between the independent and independent variables. Since we have few cases (countries) and little variation over time, we were worried about losing those cases potentially without overtime variation. Secondly, some of our independent variables do not vary over time. This makes it impossible to use them in a fixed-effects analysis because they would be automatically dropped from the statistical models by the analysis software. Finally, and for reasons similar to those stated in the first point, we wanted to maximise the type of variation to be exploited. In addition, we believe that our results are more solid if between- and within-country variation leads to same-sign estimates of the association between predictors and outcome. By the same token, this strategy allows to cast doubt about the existence of a true association if between- and within-estimates point in opposite directions. Moreover, even if the REWB also exploits the between-country variation, more affected by unobserved heterogeneity, the estimate of the within-effect is equivalent to the estimate of a fixed-effect model. Hence, with a REWB model, we get all the benefits of a fixed-effect model plus the additional estimate of the effect of between-country variation.

The application of this procedure in our paper is as follows. In the first stage, we ran a logistic regression of the effect of parental education, sex and age on attainment of a university degree for each graduation cohort in each country. Then, we estimated the average marginal effect of having a highly educated vs lowly educated father on attaining a university degree. This yielded an estimate of the inequality in educational attainment for each graduation cohort in each country. In the second stage, these estimates were regressed through the longitudinal REWB model on the between and within terms of the independent variables.

The equations for both stages of the analysis are as follows. Let ta_{ikc}, the educational attainment of individual i in graduation cohort k and

country c, be a function of the educational attainment of the father, the sex of the individual, and the age of the individual i in each graduation cohort k for each country c and an individual error term u. The equation for the regression in the first step is:

$$ta_{ikc} = \alpha + \beta_1 FeduH_{ikc} + \beta_2 FeduM_{ikc} + \beta_3 Z_{ikc} + u_{ikc}$$

where ta_{ikc} is a dummy variable indicating whether an individual i in graduation cohort k and country c has attained a tertiary education academic diploma (equal to 1) or not (equal to 0). $FeduH_{ikc}$ and $FeduM_{ikc}$ are two dummy variables equal to 1 if the highest parental education of the individual i in cohort k and country c is an ISCED 5/6 diploma ('high educational origins') or an ISCED 3/4 diploma ('medium educational origins') respectively or equal to 0 otherwise. The term Z_{ikc} is a vector of individual control variables including gender and age. u_{ikc} is a measurement error term for individual i in graduation cohort k and country c. Since the outcome is binary, this equation is estimated through a logistic regression fitted to the sample of each graduation cohort k in each country c *separately* (i.e. for each cohort-by-country cluster). The main interest lies in estimating $FeduH_{ikc}$, the difference between having high educational origins and low educational origins (the reference category) in attaining a tertiary degree.[15] This is our measure of inequality. To compare the estimates across countries, we computed the average marginal effects (AMEs) of having high vs low educational origins. These indicate the difference in percentage points of the probability of attaining a tertiary degree between individuals from low and high educational origins.

In the second stage, the interest lies in analyzing the association between the cohort-by-country-level estimates of inequality in educational attainment and the cohort-by-country- and country-level predictors. Hence, the parameter of interest is $FeduH_{ikc}$ from the first equation. The unit of analysis are now graduation cohorts nested in countries. The equation of the second step is:

$$\widehat{FeduH}_{kc} = \varphi + \beta_1 \overline{\Theta_c} + \beta_2 (\overline{\Theta_c} - \vartheta_{kc}) + \varepsilon_{kc}$$

where $\widehat{FeduH}_{kc}$ is the estimate of the effect of having a highly educated

[15]The Survey of Adult Skills follows a standard complex sampling design that was adapted in each participant country. This design requires the use of survey weights to get reliable estimates of the population (Mohadjer *et al.* 2013: ch. 15). We apply the survey weights according to the OECD guidelines to account for all these sources of bias through the 'repest' package developed for Stata to account for the complex structure of the sample and to apply replicate weights (Avvisati and Keslair 2014).

father on the child's tertiary educational attainment in country c and graduation cohort k. $\overline{\Theta_c}$ is a vector of the theoretically-relevant independent variables which represent the mean values of the Gini index, the S80/S20 ratio, of educational expansion and the regime of higher finance in country c over the time period under study. This term allows to estimate the effect of the between-country variation. $(\overline{\Theta_c} - \vartheta_{kc})$is a vector of the theoretically relevant independent variables containing the deviation between their cohort-specific mean and the overall country average. This term allows to estimate the effect of the within-country variation over time. The estimates of the second equation are obtained from a series of longitudinal linear regressions in which only the between and within components of each variable are included at a time. $\beta_1$and β_2 indicate the effect of each of these variables on the high-vs-low parental education gap. A positive coefficient of the Gini index, the S20/80 ratio and educational expansion indicate that larger values of these variables increase the gap between individuals from low and high educational origins in the probability of tertiary attainment. Coefficients for the financing regime categories indicate differences between these categories in the outcome.

Since we have a relatively small sample size at the country level (N = 28), and many independent variables for which not all countries have valid values, we initially included one independent variable at a time in the models, to avoid the risk of losing many degrees of freedom and to avoid analyzing an even smaller sample size. A second model and third models added the index of tracking and expenditure on R&D as single controls. The sample for the analysis of the effect of the different independent variables is variable across models, depending on the country availability of data for these variables (variable country sample). A similar analysis was carried out using a constant and more restricted sample that includes only countries with valid values in all independent variables (common-country sample). This allowed checking whether conclusions changed in comparison with the analysis of the variable sample.

4. Results

For each country and graduation cohort in the analysis, Figure 1 shows the difference between the marginal effect of having a highly vs a low-educated father on the probability of attaining a university degree (vs none). These marginal effects of the father's education are adjusted for gender and age. With some exceptions (Ireland, Chile), the cross-national

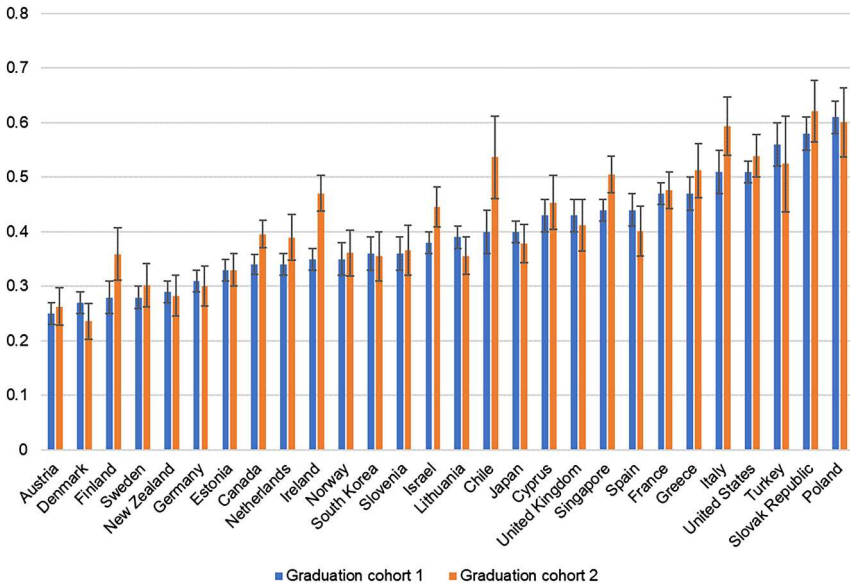

Figure 1. Difference in the predicted probability of university graduation between individuals with a highly vs a low-educated father, by country and graduation cohort.

variation is much more substantial than the within-country (over cohort) variation; in other words, the gap in university graduation by educational origins varies more between countries than within countries. This is confirmed by the descriptive statistics displayed in Table 1. The standard deviation of this variable is larger between countries (SD between) than within countries (SD within). In general, independent variables also vary more between countries than within countries.

The country-level differences by graduation cohort in the marginal effect of the father's education shown in Figure 1 become the dependent variable for the second stage of our two-stage approach, in which we apply a random-effects within–between regression. This specification allows us to disentangle the importance of the variation of our key independent variables between and within countries over time for the inequality of university graduation by parental educational origin.

Neither the analyses with the variable country sample (Table 2) nor the analysis with the constant country sample (Table 3) reveals any significant association between educational expansion, on the one hand, and the difference by parental education origin in the probability of university graduation, on the other hand. This applies to the three indicators of higher education expansion considered: the difference per country

Table 1. Descriptive statistics.

	Overall mean	SD overall	SD between	SD within	$N_{country}$	$N_{country\ x\ cohort}$
Time-varying variables						
Difference in the probability of attaining a university degree (high vs low educational origin individuals)	0.41	0.11	0.10	0.05	28	56
Educational expansión 1	11.86	9.46	8.95	3.19	25	49
Educational expansión 2	83.42	86.86	83.56	25.39	25	49
Educational expansión 3	35.56	23.09	16.90	15.91	26	52
Gini coefficient	0.31	0.05	0.06	0.00	26	44
80/20 income quintile ratio	5.47	2.10	1.96	0.43	26	45
% GDP spent on R&D	1.74	0.93	0.92	0.22	27	53
Time-constant variables						
Index of tracking[1]	−0.11	-	0.97	-	24	48
Higher education finance regime[1]						
Low tuition-low subsidies (LTLS)	20.83	-	-	-	5	10
High tuition-high subsidies (HTHS)	12.50	-	-	-	3	6
High tuition-low subsidies (HTLS)	12.50	-	-	-	3	6
Low tuition-high subsidies (LTHS)	54.17	-	-	-	13	26

[1]The index of tracking is a variable that only varies between countries (and not within countries), so only the standard deviation between countries is computed and reported.

[2]The higher education finance regime is a categorical variable that only varies between countries, but not within countries over time. The column 'overall mean' contains the relative frequencies of each category of the variable. The column '$N_{country}$' contains the number of countries in each category of the variable. The column '$N_{country\ x\ cohort}$' contains the number of times each country is observed in each category.

between the share of individuals with tertiary education in the 25–34 and 55–64 age groups (1st indicator), the relative difference expressed as the percentage of increase/decrease between these two age groups (2nd indicator), and the proportional change in gross enrolment ratio in higher education (3rd indicator). The coefficients of the between and the within components of these indicators and the share of the explained variance of the outcome are virtually zero. This evidence goes against Hypothesis 1: at least during the period covered by our study, educational expansion does not seem to be associated with lower inequality in the probability of attaining a university degree between offspring of low- and highly educated fathers.

Moving now to income inequality, as expected, the Gini coefficient turns out to be positively associated with the inequality of university graduation. Regardless of the analytical sample considered (variable country sample or constant country sample) and the introduction of controls in the analysis, the coefficients of the between and the within effects are positive, and they turn out to be statistically significant in the analysis with the constant country sample. That is, higher income inequality is associated with more inequality by parental educational origin. The

Table 2. Random effects within-between (REWB) regression results of the effect of selected variables on the cohort-by-country-level difference in the probability of attaining a university degree (versus any diploma below this level) between high- and low-educational origin individuals.

	Variable country sample		
	Model 1	Model 2 (Model 1 + index of tracking)	Model 3 (Model 1 + % GDP spent on R&D)
Educational expansion I			
Between effect	−0.00 [−0.01,0.00]	−0.00 [−0.01,0.00]	−0.00 [−0.00,0.00]
Within effect	0.00 [−0.00,0.01]	0.00 [−0.00,0.01]	−0.00 [−0.01,0.00]
$N_{countries}$ / $N_{country\ x\ cohort}$	25 / 49	24 / 48	25 / 48
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.03 / 0.03 / 0.01	0.03 / 0.04 / 0.01	0.23 / 0.20 / 0.02
Educational expansion II			
Between effect	−0.00 [−0.00,0.00]	−0.00 [−0.00,0.00]	−0.00 [−0.00,0.00]
Within effect	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]
$N_{countries}$ / $N_{country\ x\ cohort}$	25 / 49	24 / 48	25 / 48
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.00 / 0.00 / 0.00	0.01 / 0.01 / 0.00	0.22 / 0.20 / 0.02
Educational expansion III			
Between effect	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]
Within effect	−0.00 [−0.00,0.00]	−0.00 [−0.00,0.00]	−0.00 [−0.00,0.00]
$N_{countries}$ / $N_{country\ x\ cohort}$	26 / 52	24 / 48	26 / 51
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.06 / 0.07 / 0.01	0.08 / 0.10 / 0.01	0.19 / 0.18 / 0.01
Gini coefficient			
Between effect	0.60 [−0.30,1.50]	0.61 [−0.37,1.58]	0.36 [−0.61,1.33]
Within effect	1.92+ [−0.11,3.94]	1.73 [−0.37,3.83]	1.61 [−0.36,3.57]
$N_{countries}$ / $N_{country\ x\ cohort}$	26 / 44	24 / 41	26 / 44
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.19 / 0.08 / 0.17	0.20 / 0.09 / 0.14	0.25 / 0.20 / 0.15
80/20 income quintile ratio			
Between effect	0.02+ [−0.00,0.04]	0.02+ [−0.00,0.04]	0.01 [−0.02,0.04]
Within effect	−0.01 [−0.09,0.07]	−0.01 [−0.10,0.07]	0.02 [−0.04,0.07]
$N_{countries}$ / $N_{country\ x\ cohort}$	26 / 45	24 / 42	26 / 44
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.16 / 0.13 / 0.02	0.17 / 0.14 / 0.02	0.20 / 0.17 / 0.12
Higher education finance regime			
Low tuition-low subsidies (LTLS)	Ref.	Ref.	Ref.
High tuition-high subsidies (HTHS)	−0.03 [−0.12,0.07]	−0.05 [−0.14,0.04]	−0.02 [−0.12,0.08]
High tuition-low subsidies (HTLS)	−0.02 [−0.09,0.05]	−0.03 [−0.10,0.04]	−0.04 [−0.14,0.06]
Low tuition-high subsidies (LTHS)	−0.12** [−0.19,−0.05]	−0.15*** [−0.24,−0.07]	−0.09** [−0.16,−0.03]
$N_{countries}$ / $N_{country\ x\ cohort}$	24 / 48	23 / 46	24 / 47
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.13 / 0.15 / -	0.17 / 0.21 / -	0.22 / 0.24 / 0.03

Each regression coefficient and its respective confidence interval, N and R^2 in the column correspond to a different linear regression model in which only the relevant independent variable is included (or the relevant independent variable plus the control, when the latter applies).
95% confidence intervals in brackets.
Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

effect of Gini persists when controls are introduced, although it must be noted that the expenditure on R&D explains a large share of its effect. At any rate, the sign of both effects (between and within) is positive.

Less clear conclusions can be drawn from the use of the other indicator of income inequality, the ratio between the 1st and 5th quintiles of the income distribution (S80/S20). The analyses with the variable country

Table 3. Random effects within-between (REWB) regression results of the effect of selected variables on the cohort-by-country-level difference in the probability of attaining a university degree (versus any diploma below this level) between high- and low-educational origin individuals.

	Constant country sample		
	Model 4	Model 5 (Model 4 + index of tracking)	Model 6 (Model 4 + % GDP spent on R&D)
Educational expansion I			
Between effect	−0.00 [−0.01,0.00]	−0.00 [−0.01,0.00]	−0.00 [−0.00,0.00]
Within effect	−0.00 [−0.01,0.00]	−0.00 [−0.00,0.01]	−0.00 [−0.01,0.00]
$N_{countries}$ / $N_{country\ x\ cohort}$	16 / 32	16 / 32	16 / 32
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.00 / 0.00 / 0.01	0.01 / 0.02 / 0.01	0.10 / 0.10 / 0.13
Educational expansion II			
Between effect	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]
Within effect	−0.00 [−0.00,0.00]	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]
$N_{countries}$ / $N_{country\ x\ cohort}$	16 / 32	16 / 32	16 / 32
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.02 / 0.02 / 0.00	0.02 / 0.02 / 0.00	0.12 / 0.12 / 0.11
Educational expansion III			
Between effect	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]	0.00 [−0.00,0.00]
Within effect	−0.00 [−0.00,0.00]	−0.00 [−0.00,0.00]	−0.00 [−0.00,0.00]
$N_{countries}$ / $N_{country\ x\ cohort}$	16 / 32	16 / 32	16 / 32
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.00 / 0.07 / 0.04	0.01 / 0.01 / 0.04	0.10 / 0.10 / 0.12
Gini coefficient			
Between effect	1.21*** [0.59,1.84]	1.21*** [0.56,1.85]	1.15*** [0.59,1.72]
Within effect	1.45 [−0.96,3.86]	1.45 [−1.01,3.90]	0.72 [−1.46,2.89]
$N_{countries}$ / $N_{country\ x\ cohort}$	16 / 32	16 / 32	16 / 32
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.35 / 0.41 / 0.09	0.36 / 0.41 / 0.09	0.41 / 0.47 / 0.13
80/20 income quintile ratio			
Between effect	0.04*** [0.02,0.06]	0.04*** [0.02,0.07]	0.04*** [0.03,0.06]
Within effect	0.06** [0.02,0.09]	0.06** [0.02,0.09]	0.05+ [−0.00,0.10]
$N_{countries}$ / $N_{country\ x\ cohort}$	16 / 32	16 / 32	16 / 32
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.40 / 0.44 / 0.20	0.40 / 0.44 / 0.20	0.47 / 0.53 / 0.21
Higher education finance regime			
Low tuition-low subsidies (LTLS)	Ref.	Ref.	Ref.
High tuition-high subsidies (HTHS)	−0.01 [−0.11,0.09]	−0.04 [−0.14,0.06]	−0.02 [−0.13,0.09]
High tuition-low subsidies (HTLS)	0.00 [−0.07,0.07]	−0.02 [−0.10,0.06]	0.02 [−0.04,0.09]
Low tuition-high subsidies (LTHS)	−0.10** [−0.18,−0.03]	−0.14*** [−0.24, −0.04]	−0.10** [−0.16,−0.03]
$N_{countries}$ / $N_{country\ x\ cohort}$	16 / 32	16 / 32	16 / 32
$R^2_{overall}$ / $R^2_{between}$ / R^2_{within}	0.19 / 0.23 / -	0.27 / 0.33 / -	0.27 / 0.30 / 0.11

Each regression coefficient and its respective confidence interval, N and R^2 in the column correspond to a different linear regression model in which only the relevant independent variable is included (or the relevant independent variable plus the control, when the latter applies).
95% confidence intervals in brackets.
Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

sample (Table 2) show that the between-country effect is consistently positive despite controls, but the within-country effect swings from negative to positive when the expenditure on R&D is controlled for. The between and within estimates from the constant country sample are consistently positive and stable regardless of controls. The contrast with the variable country sample in the within-effect might indicate that the effect of the income ratio is too sensitive to the countries included in the analysis. At least as regards the between-effect, both indicators of income

inequality point overall in the same direction: a positive association between income inequality and inequality of university graduation. Looking back to the graph in Figure 1, the countries with higher differences between the effect of having a highly vs a low-educated father on the probability of any university graduation (US, Central and Eastern European countries, some Southern European countries) are certainly countries with higher income inequality than the ones at the bottom of the ranking (Denmark, Finland, Sweden). In sum, the evidence drawn from our analyses partly supports Hypothesis 2: income inequality is associated with higher inequality in university attainment.

The possible effect of income inequality on inequalities of university graduation by social origin can be compensated by the generosity of the regime of higher education finance, and this is precisely the other key independent variable in our study. Given its constant nature over time, however, we cannot consider the within-country variation, only the between-country variation. Although the results of the analysis do not offer the ranking of the different regimes of higher education finance that could have been initially expected according to their relative generosity (LTHS is the most generous regime, HTLS is the least generous and LTLS and HTHS are in the middle), we certainly see that, in the analysis with the variable and common country sample, the most generous regime (LTHS) certainly appears negatively associated with inequality of university graduation by parental education, and such an effect is robust to the introduction of the country-level controls considered in the analysis (tracking and percentage of GDP spent on R&D). In other words, a regime of higher education finance that provides generous subsidies *and at the same time* does not request high fees from university students seems to be a context in which inequality of university graduation by parental education origin is lower than in other regimes.

Quite paradoxically, the ranking of these other three regimes is not exactly the one to be expected from their relative generosity. Although the less generous type (HTLS) has a positive coefficient in some analyses (which would be in the direction of reinforcing the contrast between the effect of having a low- vs a highly educated father on the probability of university graduation), the size of the coefficient is small, and it often swings from a positive to a negative sign (constant country sample, Table 3). In other words, the level of inequality associated to it is not clearly higher than in the other regimes. Moreover, a type of higher education finance that should be ranked in the middle in terms of its generosity (HTHS) actually presents a negative coefficient (although not

significant) that would reflect lower inequality of graduation than the category of reference (LTLS).

It could be argued that the two-year community college programmes so common in the US could upwardly bias the results corresponding to the regime this country belongs to (HTHS), in the sense of reducing the inequality of college graduation. Although affected by quite a high dropout rate, these programmes would offer students from a lower social background an opportunity for attaining a university degree that does not exist in other countries where the shortest university degrees are always longer than that (Brint and Karabel 1989; Schudde and Goldrick-Rab 2015). Yet, additional robustness checks carried out taking the US out of the main analysis,[16] far from reducing the negative sign corresponding to the HTHS in the analysis, strengthen it. In sum, community colleges may be reasonably discarded as one of the reasons why the HTHS regime shows a relatively good record in terms of equality of graduation, vis-à-vis LTLS and HTLS.

Unlike the variable country sample (built in order to maximise the number of countries considered for the analysis of each of our key independent variables), the constant country sample allows us to compare the goodness of fit of the different models, thus formulating an informed guess about which key independent variable matters more for explaining the between-country and over-time differences in the probability of university graduation by parental education. If we look at the goodness of fit of their corresponding models, represented by their R^2 (Table 3), it certainly looks as if income inequality is more decisive for explaining the between and over-time variations in the difference in the probability of university graduation by parental education than the generosity of the regime of higher education finance. Gini coefficient and S80/S20 ratio contribute to explain 35% and 40%, respectively, of the overall variation (Model 4, Table 3) in the outcome, whereas the typology of higher education finance only contributes to explain 19%. In line with the greater variation between countries than within countries in predictors and in the outcome, the between-country variation explained by indicators of income inequality is larger than the within-country variation. They explain a similar share of the variance of the outcome, albeit the income ratio does so to a slightly larger extent. Their association with the outcome is stronger than the association between the higher education finance regime and the outcome.

[16]Results are available upon request.

Table 4. Predicted average value of the difference in the probability of attaining a university degree between highly and lowly educated individuals at representative values of the independent variables (Gini and 80/20 income ratio) and in each category of the higher education finance regime.

	Predictor	
Score in predictor	Gini coefficient	80/20 income ratio
Lowest	0.30	0.31
Mean	0.38	0.38
Highest	0.46	0.49
Mean -/+ 1 SD	0.33, 0.43	0.33, 0.43
Higher education finance regime		
Low tuition-low subsidies (LTLS)	0.40	
High tuition-high subsidies (HTHS)	0.38	
High tuition-low subsidies (HTLS)	0.43	
Low tuition-high subsidies (LTHS)	0.31	

Another way of ascertaining the relative effect size of each independent variable is computing the predicted value of the outcome for representative values of independent variables. Table 4 displays the predicted average value of the dependent variable (the probability gap in university graduation) for the countries with the lowest, mean, and highest score in the Gini coefficient and income ratio and for countries in each regime of higher education finance. These values are computed based on estimates from model 6 in Table 3 (constant country sample; expenditure in R&D added as control) and using the between-country components as predictors (i.e. the mean across cohorts). Moving from the country with the lowest Gini coefficient (Denmark, Gini coefficient = 0.23) to the most unequal country (United States, Gini coefficient = 0.37) implies moving from a predicted probability gap of university attainment between individuals of high and low educational origins of 30 p.p. to a predicted gap of 46 p.p. That is, the predicted gap in university graduation is 50% higher in the most unequal than in the most equal country. If we focus on income inequality measured by the 80/20 income quintile ratio, moving from the least unequal country (Denmark, 80/20 ratio = 3.29) to the most unequal one (United States, 80/20 ratio = 7.38) implies an increase in the predicted gap in university graduation from 31 p.p. to 49 p.p. – a 58% increase. A decrease/increase by one standard deviation around the mean of each of these predictors (what can be considered a 'typical' or 'normal' change in their value) yields a similar predicted average gap in university graduation for both: an interval between 33 and 43 p.p. in the probability gap in university graduation.

Moving now to the predicted average gap in university graduation across higher education finance regimes, the only one that stands out is the LTHS regime, the most generous one. The average predicted inequality in the countries belonging to this regime is 30 p.p. between individuals from low and high educational origins. The rest of the regimes have an average gap around 40 p.p. This means that, even after controlling by the R&D expenditure, which also has an equalising effect, the inequality in university graduation is around 23% lower in countries belonging to the LTHS regime than in the other three regimes. Since the finance regime a country belongs to is quite stable over time (cf. Garritzmann 2016), which means that countries do not easily change regimes, and inequality levels are similar in the other regimes, the equalising effect of the HTHS regime can be considered strong.

4.1. Germany and Austria

Figure 1 shows a degree of equality of graduation between children of highly and low-educated parents in Austria and Germany that does not accord well with the expectation coming from the regime of higher education finance they belong to, according to Garritzmann's typology (LTLS). The relatively egalitarian nature of Austria and Germany has also been observed by Liu *et al.* (2016) in their cross-national analysis of expansion of higher education and equal opportunities. There may be two reasons why the inequality of university graduation in Germany and Austria is lower than what would be expected from their level of public financial support for university education.

The first explanation comes from the fact, stressed by Green and Pensiero (2016), that relatively strong tracking in these countries is combined with a quite prestigious vocational training system, which not only appeals to many, but also provides relatively good access to universities of applied sciences (*Fachhochschulen*). These universities are found to be particularly effective in providing equality of graduation at the tertiary level, unlike what happens with traditional universities (Duru-Bellat *et al.* 2008; Blossfeld *et al.* 2015). In fact, whereas the likelihood of university attendance has been much larger and rather constant for individuals from a high social origin than for individuals from a low social origin during the 1980s and 1990s, inequality by social origin in attendance at universities of applied sciences has been much lower and slightly favourable to low-origin individuals (Reimer and Pollak 2010; Schindler and Reimer 2011). And although traditional university is still the main

tertiary education destination in Germany for individuals gaining eligibility for higher education, from 2000 to 2012 the number of new students enrolled each year in universities of applied sciences increased at a faster rate than in universities (Statistiches Bundesamt 2019, 9). Yet, the educational programmes of universities of applied sciences are equally classified as ISCED5A in our analysis.

The situation in Austria seems similar, to some extent. Universities of applied sciences belonging to academic tertiary education also exist, and different vocational educational schools award a full- and a restricted-access higher education qualification. Students attending four-year programmes in *Berufsbildende Mittlere Schule* or five-year programmes in *Berufsbildende Höhere Schule* can achieve either a general higher education qualification or a restricted one that gives access only to universities of applied sciences.[17] Therefore, it is not strange to see that the introduction of tracking as a control (Model 5, Table 3) enhances the association between the most generous regime of higher education finance and the outcome, by comparison to the reference regime (LTLS), which is where Austria and Germany are included.

A second explanation comes from the position Germany and Austria occupy in their own regime of higher education finance. In terms of fees, Austria and Germany are placed in the limit of the LTLS regime in which they are classified. Tuition fees are relatively low (Austria) or non-existent (Germany). These two countries are thus quite generous within the regime of higher education finance in which they are located. Quite interestingly, Green and Pensiero (2016) use a typology that is relatively similar to Garritzmann's. Some countries in Garritzmann's LTLS regime are combined, but Austria and Germany constitute a distinctive type (Green and Pensiero 2016; Liu *et al.* 2016). It is noticeable that excluding Germany and Austria from the analysis (results available upon request) results in an increase of the percentage of between-country variance explained by the different models made with the constant country sample, and it makes the equalising effect of the most generous type (LTHS) even more salient in the models in which the tracking index is not included. In sum, part of the equalising effect of the LTLS regime (reference category) may come from the inclusion in this category of countries (Austria and Germany) whose regimes of higher education show some equalising features.

[17]The Austrian Education System. Retrieved 29 June 2021 from https://www.bildungssystem.at/en/

5. Conclusions

The steady decrease in the inequality of educational attainment by social origin observed during the middle decades of the twentieth century came to a halt in the last decades of the century, roughly when educational expansion became more pronounced. This may have to do both with the inequality that may have emerged within the university realm and with factors different from educational expansion that fall within and outside the realm of education. These factors may also help explain cross-national differences in inequality of university graduation. Previous analyses have shown that expansion of higher education does not necessarily entail an increase in equality of educational opportunities for university attendance (Arum *et al.* 2007); our work seeks to contribute to this literature by looking at the importance of this type of educational expansion vis-à-vis public financial support for higher education and income inequality. As such, we provide a more integrated account of which of these factors matters more in shaping inequality of university attainment.

Resorting to the OECD Survey of Adult Skills data for 28 countries and country-level data on educational expansion, income inequality, and type of higher education finance drawn from different sources, we have explored the degree to which social origin (father's education) has a meaningful effect on university graduation. As expected, our results indicate that the father's education is associated with the probability of attaining a university degree. By means of a two-stage approach, we then explored cross-national variation in the inequality of university graduation, paying particular attention to higher education expansion, income inequality and the regime of higher education finance.

Unlike what was initially argued by Mare (1981), and in line with Bar Haim and Shavit's (2013) findings in their analysis of upper secondary education attendance and entry into tertiary education in 24 countries participating in the European Social Survey, we do not find conclusive evidence that expansion of higher education moderates the link between the father's education and the probability of attaining a university degree. Educational expansion has indeed shown a negative effect on inequality of educational attainment when looking at educational reforms for all the possible stages in the educational trajectory (primary, secondary, tertiary) (Braga *et al.* 2013), and expansion of higher education in particular may have had a more positive effect on reducing inequality of higher education attainment in the past (Braga

et al. 2013; Liu *et al.* 2016), when other conditions for profiting from educational expansion were there, so that individuals from a less advantaged origin could seize them. The situation may have changed recently because these conditions (in particular, low income inequality and welfare support) have been recently eroded.

Quite interestingly, the national characteristics showing a more robust association with inequality of basic university graduation by social origin (father's education) are income inequality and the generosity of the regime of higher education finance. The effect of the father's education on basic university graduation turns out to be stronger in countries with higher income inequality. As regards higher education finance, there is also evidence of the effectiveness of a generous system (LTHS) in reducing the effect of the father's education on the probability of basic university graduation (vs none). The effect is less clear for the other three types of higher education finance (less generous), but there is some evidence that, between fees and subsidies, high subsidies may be slightly more effective than low fees in reducing inequality of graduation by the father's education, since the HTHS regime also yields some positive results in terms of reduction of the effect of the father's education. This would align with Braga et al.'s (2013) findings about the negative association between increasing grant availability and different measures of educational inequality used in their analysis of educational reforms in 24 countries.

In sum, our evidence points to the importance of factors that are not strictly related to the system of education, but to the financial restrictions hampering university attendance and graduation. Quite interestingly, policies aimed at improving only aspirations to higher education among students from a disadvantaged background have not been found to be sufficient to turn these aspirations into a real increase in enrolment. In her recent analysis of the United Kingdom's Widening Participation Programme, aimed at widening higher education aspirations among adolescents from a lower social background, Rizzica (2020) found that the programme certainly increased their aspirations, but these aspirations did not turn into an increase of their college enrolment. Removing 'nonfinancial constraints' was not enough. As concluded by the author, it may be necessary, among other things, to ensure that disadvantaged students with sufficient skills to get into college 'have access to sufficient financial means to afford higher education' (Rizzica 2020, 186).

Financial factors may be more decisive than educational expansion in promoting equality of outcomes at the top of the education ladder. A more equal income distribution and a welfare state facilitating university access and graduation for students from a low socioeconomic background (through low fees but mostly through subsidies for university education) may be more effective for increasing social equality of when the focus is on achieving a university diploma, regardless of its level in the vertical hierarchy. Conversely, countries where income inequality increases or where the system of social support for university graduation for students from a low socioeconomic background is low may be more liable to the stall in the secular process of reduction of the inequality of educational opportunities by social origin that characterised the last decades of the twentieth century.

Finally, this study presents some limitations. First, instead of measuring country-level variables at or around the moment individuals were assumed to be at risk of attending postgraduate education for each age cohort, we used a single measure to summarise the situation within each age cohort. Moreover, the dependent and independent variables are measured at the same point in time, so an ordering in which the independent variables are measured at an earlier time point than the dependent variable cannot be established. However, country variables like income inequality, stratification of the system of education, or the higher education regime are quite stable over the period under analysis. We also assume the index of stratification, only available for one year in Bol and Van de Werfhorst's (2012) database, to be reasonably stable over time.

Second, social origin has been measured using the father's education only, but social origin includes other relevant dimensions like parental occupational and household income. We believe that if parental income when the interviewees were 14 had been available in our data, inequality of university graduation would have been higher because there is a degree of within-educational-category income heterogeneity that is not captured in our analysis and would have affected the relative opportunities of high- vs low-income parents graduating from college. Third, due to a low sample size at the country level, we could not easily make compatible including several country variables to rule out alternative explanations at the same time in statistical models and keeping the largest sample size. However, the attempt to include in regression models only countries with valid values in all independent variables yielded partly similar results to the analysis from simple regressions.

Finally, in order to capture public financial support for higher education, we have resorted to a typology of national regimes of higher education finance (Garritzmann 2016). From an analytical point of view, specific numerical indicators capturing different dimensions of that public support would have been preferable to a typology, since typologies make it difficult to discern which institutional feature constituting a type is more decisive in explaining a given outcome, and they may conceal within-type heterogeneity or variation. Unfortunately, given the number of aspects to consider in higher education finance, the relatively limited time available in publicly available statistical databases for specific numerical variables (as recognised by Garritzmann himself), the need to combine the different aspects of finance into single and meaningful dimensions, and the limited number of countries in our analysis, Garritzmann's typology is (so far) the best way of covering the whole range of higher education finance possibilities across countries in our analysis. Replications of the analysis would be desirable (with a more suitable time span and cross-national data) for specific indicators considered in Garritzmann's typology.

For some of these reasons, we cannot claim that the associations we found are causal; we can only observe a correlational association that might be affected by unobserved confounders, although we tried our best to rule out some alternative explanations by introducing several controls given the limitations of our data and by exploiting variation *between and within countries*. In order to more clearly establish the causality of the associations we found, our data should meet certain conditions, like being completely longitudinal. This would enable to measure predictors and outcomes at more time points and to further exploit over time variation. This would also make it easier to identify quasi-experimental situations that enable the application of causal inference techniques adequate for observational data.

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Code and data availability

The datasets analyzed during the current study are publicly available on the website of the OECD Skills Surveys (https://www.oecd.org/skills/piaac/) under the form of Public Use Files (PUF) in the following link: https://www.oecd.org/skills/piaac/data/ The specific dataset employed for the analysis and the Stata syntax files containing the code used to run the analyses are publicly available at https://osf.io/tkpn6/

Ethics approval

Not applicable.

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References

Abbiati, G. and Barone, C. (2017) 'Is university education worth the investment? The expectations of upper secondary school seniors and the role of family background', *Rationality and Society* 29(2): 113–59.

Aguinis, H., Gottfredson, R. K. and Culpepper, S. A. (2013) 'Best-practice recommendations for estimating cross-level interaction effects using multilevel modeling', *Journal of Management* 39(6): 1490–528. doi:10.1177/0149206313478188.

Alvaredo, F., Chancel, L., Piketty, T., Saez, E. and Zucman, G. (2017) 'Global inequality dynamics: new findings from WID.world', *American Economic Review* 107(5): 404–9.

Arum, R., Gamoran, A. and Shavit, Y. (2007) 'More inclusion than diversion: expansion, differentiation, and market structure in higher education. In *Stratification in Higher Education—A Comparative Study*, 1–35. Stanford: Stanford University Press.

Asplund, R., Adbelkarim, O. B. and Skalli, A. (2008) 'An equity perspective on access to, enrolment in and finance of tertiary education', *Education Economics* 16(3): 261–74.

Avvisati, F. and Keslair, F. (2014) 'REPEST: Stata module to run estimations with weighted replicate samples and plausible values' https://EconPapers.repec.org/RePEc:boc:bocode:s457918.

Ballarino, G., Bernardi, F., Requena, M. and Schadee, H. (2008) 'Persistent inequalities? Expansion of education and class inequality in Italy and Spain', *European Sociological Review* 25(1): 123–38. doi:10.1093/esr/jcn031.

Bar Haim, E. and Shavit, Y. (2013) 'Expansion and inequality of educational opportunity: A comparative study', *Research in Social Stratification and Mobility* 31: 22–31. doi:10.1016/j.rssm.2012.10.001.

Barone, C. (2019) *Towards an Education-based Meritocracy?* ISA eSymposium for Sociology. Retrieved from ttps://spire.sciencespo.fr/hdl:/2441/c2j08frce9-cu9glf4rqnapkg3/resources/ebul-barone-mar2019.pdf.

Barone, C. and Ruggera, L. (2018) 'Educational equalization stalled? Trends in inequality of educational opportunity between 1930 and 1980 across 26 European nations', *European Societies* 20(1): 1–25. doi:10.1080/14616696.2017.1290265.

Becker, R. and Hecken, A. E. (2008) 'Why are working-class children diverted from universities?--An empirical assessment of the diversion thesis', *European Sociological Review* 25: 233–50. doi:10.1093/esr/jcn039.

Bernardi, F. and Ballarino, G. (2014) 'Participation, equality of opportunity and returns to tertiary education in contemporary Europe', *European Societies* 16(3): 422–42. doi:10.1080/14616696.2012.750729.

Bernardi, F., Hertel, F. R. and Yastrebov, G. (2018) 'A U-turn in inequality in college attainment by parental education in the US?', *Research in Social Stratification and Mobility* 58: 33–43.

Blau, P. M. and Duncan, O. D. (1967) *The American Occupational Structure*, John Wiley & Sons.

Blossfeld, P. N., Blossfeld, G. J. and Blossfeld, H. P. (2015) 'Educational expansion and inequalities in educational opportunity: long-term changes for East and West Germany', *European Sociological Review* 31(2): 144–60. doi:10.1093/esr/jcv017.

Bol, T. and Van de Werfhorst, H. (2012) 'Measuring Educational Diversity: Tracking, Vocational Orientation, and Standardisation', AMCIS Working Paper 1, January 2012, Amsterdam.

Bol, T. and Van de Werfhorst, H. (2013) 'Educational systems and the trade-off between labor market allocation and equality of educational opportunity', *Comparative Education Review* 57(2): 285–308.

Boliver, V. (2011) 'Expansion, differentiation, and the persistence of social class inequalities in British higher education', *Higher Education* 61(3): 229–42. doi:10.1007/s10734-010-9374-y.

Bourdieu, P. (1984) *Distinction: A Social Critique of the Judgement of Taste*, Harvard University Press.

Bourdieu, P. and Passeron, J. C. (1977) *Reproduction in Education, Society and Culture*, Sage.

Braga, M., Checchi, D. and Meschi, E. (2013) 'Educational policies in a long-run perspective', *Economic Policy* 28(73): 45–100.

Breen, R. (2010) 'Social mobility and equality of opportunity Geary lecture spring 2010', *The Economic and Social Review* 41(4): 413.

Breen, R. and Goldthorpe, J. H. (1997) 'Explaining educational differentials', *Rationality and Society* 9(3): 275–305. doi:10.1177/104346397009003002.

Breen, R., Luijkx, R., Müller, W. and Pollak, R. (2009) 'Nonpersistent inequality in educational attainment: evidence from eight European countries', *American Journal of Sociology* 114(5): 1475–521.

Brint, S. and Karabel, J. (1989) 'American education, meritocratic ideology, and the legitimation of inequality: the community college and the problem of American exceptionalism', *Higher Education* 18(6): 725–35.

Bryan, M. L. and Jenkins, S. P. (2016) 'Multilevel modelling of country effects: a cautionary tale', *European Sociological Review* 32(1): 3–22. doi:10.1093/esr/jcv059.

Cingano, F. (2014) 'OECD social, employment and migration working papers, *Employment and Migration Working Papers*, No. 163. Publishing. doi:10.1787/5jxrjncwxv6j-en

Duru-Bellat, M., Kieffer, A. and Reimer, D. (2008) 'Patterns of social inequalities in access to higher education in France and Germany', *International Journal of Comparative Sociology* 49(4–5): 347–68. doi:10.1177/0020715208093081.

Fairbrother, M. (2014) 'Two multilevel modeling techniques for analyzing comparative longitudinal survey datasets', *Political Science Research and Methods* 2(1): 119–40. doi:10.1017/psrm.2013.24.

Garritzmann, J. L. (2016) *The Political Economy of Higher Education Finance: The Politics of Tuition Fees and Subsidies in OECD Countries, 1945–2015*, Palgrave Macmillan.

Goldrick-Rab, S., Kelchen, R., Harris, D. N. and Benson, J. (2016) 'Reducing income inequality in educational attainment: experimental evidence on the impact of financial aid on college completion', *American Journal of Sociology* 121(6): 1762–817.

Green, A. and Pensiero, N. (2016) 'The effects of upper-secondary education and training systems on skills inequality. A quasi-cohort analysis using PISA 2000 and the OECD survey of adult skills', *British Educational Research Journal* 42 (5): 756–79. doi:10.1002/berj.3236.

Hansen, M. N. (1997) 'Social and economic inequality in the educational career: do the effects of social background characteristics decline?', *European Sociological Review* 13(3): 305–21.

Haveman, R. and Smeeding, T. (2006) 'The role of higher education in social mobility', *The Future of Children* 16(2): 125–50. https://www.jstor.org/stable/3844794.

Heisig, J. P. and Schaeffer, M. (2019) 'Why you should always include a random slope for the lower-level variable involved in a cross-level Interaction', *European Sociological Review* 35(2): 258–79. doi:10.1093/esr/jcy053.

Herbaut, E. and Geven, K. (2020) 'What works to reduce inequalities in higher education? A systematic review of the (quasi-)experimental literature on outreach and financial aid', *Research in Social Stratification and Mobility* 65: 100442.

Hillmert, S., and Jacob, M. (2003) 'Social inequality in higher education. Is vocational training a pathway leading to or away from university?', *European Sociological Review*, 19(3), 319-34. doi:10.1093/esr/19.3.319

Hout, M. (1988) 'More universalism, less structural mobility: The American occupational structure in the 1980s', *American Journal of Sociology* 93(6): 1358–400.

Karlson, K. B. (2019) 'College as equalizer? Testing the selectivity hypothesis', *Social Science Research* 80: 216–29. doi:10.1016/j.ssresearch.2018.12.001.

Kogan, I., Gebel, M. and Noelke, C. (2012) 'Educational systems and inequalities in educational attainment in central and eastern European Countries', *Studies of Transition States and Societies* 4(1): 69–83. http://nbn-resolving.de/urn:nbn:de:0168-ssoar-362941.

Liu, Y., Green, A. and Pensiero, N. (2016) 'Expansion of higher education and inequality of opportunities: a cross-national analysis', *Journal of Higher Education Policy and Management* 38(3): 242–63. doi:10.1080/1360080X.2016.1174407.

Lucas, S. R. (2001) 'Effectively maintained inequality: education transitions, track mobility, and social background effects', *American Journal of Sociology* 106(6): 1642–90. doi:10.1086/321300.

Lucas, S. R. (2009) 'Stratification theory, socioeconomic background, and educational attainment', *Rationality and Society* 21(4): 459–511. doi:10.1177/1043463109348987.

Mare, R. D. (1981) 'Change and stability in educational stratification', *American Sociological Review* 46(1): 72–87. doi:10.2307/2095027.

Marginson, S. (2016) 'The worldwide trend to high participation higher education: dynamics of social stratification in inclusive systems', *Higher Education* 72(4): 413–34. doi:10.1007/s10734-016-0016-x.

Meraviglia, C. and Buis, M. L. (2015) 'Class, status, and education: the influence of parental resources on IEO in Europe, 1893–1987', *International Review of Social Research* 5(1): 35–60. doi:10.1515/irsr-2015-0004.

Milanovic, B. (2013) 'Global income inequality in numbers: in history and now', *Global Policy* 4(2): 198–208. doi:10.1111/1758-5899.12032.

Milanovic, B. (2022) 'The Three Eras of Global Inequality, 1820-2020 with the Focus on the Past Thirty years', *Stone Center on Socio-Economic Inequality Working Paper Series*, No.59, December 2022.

Mohadjer, L., Krenzke, T., Van de Kerckhove, W. and Hsu, V. (2013) 'Survey weighting and variance Estimation', in OECD, *Technical Report of the Survey of Adult Skills*. Retrieved June 11, 2020, from https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf.

Müller, W. and Wolbers, M. H. (2003) 'Educational attainment in the European Union: recent trends in qualification patterns', in W. Müller and M. Gangl (eds.), *Transitions from Education to Work in Europe. The Integration of Youth into EU Labour Markets*, 23-62. Oxford University Press.

OECD (2013) *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills*, OECD Publishing. doi:10.1787/9789264204256-en

OECD (2015) *Education at a Glance 2015: OECD Indicators*, OECD Publishing. doi:10.1787/eag-2015-en

OECD (2016) *The Survey of Adult Skills: Reader's Companion*, 2nd ed. OECD Publishing. doi:10.1787/9789264258075-en

Pfeffer, F. T. and Hertel, F. R. (2015) 'How has educational expansion shaped social mobility trends in the United States?', *Social Forces* 94(1): 143–80. doi:10.1093/sf/sov045.

Piketty, T. and Zucman, G. (2014) 'Capital is back: wealth-income ratios in rich countries 1700–2010 *', *The Quarterly Journal of Economics* 129(3): 1255–310. doi:10.1093/qje/qju018.

Raffe, D., Brannen, K., Fairgrieve, J. and Martin, C. (2001) 'Participation, inclusiveness, academic drift and parity of esteem: a comparison of post-compulsory education and training in England, Wales', *Scotland and Northern Ireland', Oxford Review of Education* 27(2): 173–203.

Raftery, A. E. and Hout, M. (1993) 'Maximally maintained inequality: expansion, reform, and opportunity in Irish education, 1921–75', *Sociology of Education* 66: 41–62. doi:10.2307/2112784.

Reimer, D. and Pollak, R. (2010) 'Educational expansion and its consequences for vertical and horizontal inequalities in access to higher education in west Germany', *European Sociological Review* 26(4): 415–30. doi:10.1093/esr/jcp029.

Rizzica, L. (2020) 'Raising aspirations and higher education: evidence from the United Kingdom's widening participation policy', *Journal of Labor Economics* 38(1): 183–214. doi:10.1086/704571.

Schindler, S. and Reimer, D. (2011) 'Differentiation and social selectivity in German higher education', *Higher Education* 61(3): 261–75. doi:10.1007/s10734-010-9376-9.

Schneider, S. L. (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): 343–57. doi:10.1016/j.rssm.2010.03.001.

Schneider, S. L. (2018) 'Education in OECD's PIAAC study: how well do different harmonized measures predict skills?', *Methods, Data, Analyses: A Journal for Quantitative Methods and Survey Methodology (mda)* 12(1): 151–76. doi:10.12758/mda.2017.15.

Schudde, L. and Goldrick-Rab, S. (2015) 'On second chances and Stratification', *Community College Review* 43(1): 27–45. doi:10.1177/0091552114553296.

Shavit, Y., Arum, R. and Gamoran, A. (2007) *Stratification in Higher Education: A Comparative Study*, Stanford University Press.

Shavit, Y. and Blossfeld, H. P. (1993) *Persistent Inequality: Changing Educational Attainment in Thirteen Countries*, Westview Press.

Statistiches Bundesamt (2019) *Bildung un Kultur: Studierende an Hochschulen Wintersemester 2018/19*, Statistiches Bundesamt.

Stolzenberg, R. M. (1994) 'Educational continuation by college graduates', *American Journal of Sociology* 99(4): 1042–77.

Suhonen, T. and Karhunen, H. (2019) 'The intergenerational effects of parental higher education: evidence from changes in university accessibility', *Journal of Public Economics* 176: 195–217.

Swift, A. (2004) 'Would perfect mobility be perfect?', *European Sociological Review* 20 (1): 1–11.

Thomsen, J. P. (2015) 'Maintaining inequality effectively? Access to higher education programmes in a universalist welfare state in periods of educational expansion 1984–2010', *European Sociological Review* 31: 683–96. doi:10.1093/esr/jcv067.

Treiman, D. J. (1970) 'Industrialization and social stratification*', *Sociological Inquiry* 40(2): 207–34. doi:10.1111/j.1475-682X.1970.tb01009.x.

Triventi, M. (2013) 'Stratification in higher education and its relationship with social inequality: a comparative study of 11 European Countries', *European Sociological Review* 29(3): 489–502. doi:10.1093/esr/jcr092.

Van Doorn, M., Pop, I. and Wolbers, M. H. (2011) 'Intergenerational transmission of education across European countries and cohorts', *European Societies* 13(1): 93–117. doi:10.1080/14616696.2010.540351.