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Parental Schooling, Educational Attainment, Skills, and Earnings: A Trend Analysis across Fifteen Countries

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Using data on fifteen countries based on the harmonization of IALS and PIAC data, we provide a cross-national analysis of the evolution of the role of educational attainment and cognitive skills as mediators of intergenerational inequalities between 1994 and 2015. We find that the association between parents' education and children's earnings is large and highly stable over time in most countries, except for Scandinavian countries, where we detect a downward trend. Conversely, the United States stands out as the country displaying the largest earning differentials by parents' education and as the only country where these differentials increased over time. We demonstrate that educational attainment and skills contributed in different ways to the persistence of these intergenerational inequalities. On the one hand, educational equalization was compensated by increasing earning returns to education in several countries. On the other hand, the association between parents' education and cognitive skills, as well as the related earning returns, stayed largely unchanged across these two decades.

Introduction

Socioeconomic status displays a high degree of intergenerational persistence, and education is a well-documented key mediator of the relationship between family background and socioeconomic outcomes in developed countries (Breen and Müller 2020; Erola et al. 2016). Educational

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equalization is therefore widely regarded as a key lever to reduce intergenerational inequalities. While earlier research pointed to stable educational inequalities in Europe and North America (Shavit and Blossfeld 1993), more recent studies report a decline of social inequalities in educational attainment for the cohorts born between the mid-1930s and mid-1950s, which slowed down or even halted in later cohorts (Barone and Ruggera 2018; Breen and Müller 2020; Breen et al. 2009, 2010). Moreover, these equalizing trends were not uniform, since Nordic countries experienced substantial declines of educational inequality, while Germany, France, and other western European countries displayed milder reductions, and there is evidence of an overall stability for the UK, the United States, and some eastern European countries (Breen et al. 2009; Esping-Andersen 2015).

The implications for labor market inequalities of these cohort trends in education are less clear. Comparative social mobility research reports that educational equalization fostered increased social fluidity for the cohorts born between 1930 and 1950 and little change thereafter because the association between education and social class destinations stayed largely unchanged over time across several western countries (Bernardi and Ballarino 2016; Breen and Müller 2020). Country differences are again relevant with lower intergenerational correlations in countries where income inequalities are lower (Hertel and Groh-Samberg 2019).

However, the significance of the aggregate class schemes used in these social mobility studies has been increasingly questioned in context of growing income inequality (Sakamoto and Wang 2020). Since individuals are unlikely to change their social class after the age of 40, corresponding to the so-called stage of occupational maturity (Erikson and Goldthorpe 1992), class analysis is not in a good position to assess the implications of growing economic inequalities in recent decades for the labor market outcomes of mid- and late-career workers belonging to the cohorts that experienced educational equalization. Indeed, previous research documented substantial variation in earnings and career prospects within the upper, middle, and working classes (Smallenbroek et al. 2022). Unsurprisingly, social stratification researchers are increasingly turning their attention to the analysis of intergenerational inequalities in earnings, income, and wealth (Barone et al. 2022; Sakamoto and Wang 2020). Furthermore, in a context of massification of education, sociologists and economists have increasingly stressed the role of educational achievement and cognitive skills as predictors of economic outcomes over and above educational attainment (Castex and Kogan Dechter 2014; Mood et al. 2012). Hence, standard social mobility research on the so-called OED triangle connecting class of origin, education, and destination class has been increasingly complemented by intergenerational studies focusing on the respondent's income and integrating the role of cognitive skills together with educational attainment (Hanushek et al. 2015; Mood et al. 2012).

However, most of these studies are conducted in a single country (Blanden et al. 2007; Bowles, Gintis, and Osborn Groves 2005; Mood et al. 2012) or compare only a handful of countries (Gregg et al. 2017), and none of these studies have so far integrated a dynamic perspective within a cross-national design. Hence, owing to a lack of suitable data, we lack large-scale, comparative studies assessing the evolution over time of the role of educational attainment and cognitive skills as mediators of intergenerational inequalities in economic outcomes.

This article begins to fill this gap by assembling an unprecedented dataset containing comparable measures for parents' education, respondent's educational attainment, cognitive skills, and earnings. For this purpose, we rely on the harmonization of two high-quality and highly comparable large-scale studies carried out by the OECD, namely the International Adult Literacy Survey (IALS 1994–1998) and the Programme for the International Assessment of Adult Competencies (PIAAC 2011–2015).[1] For a subset of fifteen countries covering a broad variety of economic and institutional contexts, we first describe country-specific, period changes between the 1990s and the 2010s in the association between parents' education and respondents' earnings. Then, we assess how the mediating role of educational attainment and cognitive skills has evolved over time across these fifteen countries. For this purpose, we analyze changes in the associations between parents' education, respondent's education, skills, and earnings between 1994 and 2015.

In the next section, we rely on mainstream social stratification theories to formulate hypotheses concerning the role of education and cognitive skills for trends over time in intergenerational inequalities. In Data and Variables, we describe the data and variables; in Statistical Models, we discuss our modeling strategy; and in Results, we present the results for intergenerational inequalities (Intergenerational Inequalities: Parents' Education and Respondent's Earnings), educational and skill inequalities (Educational Inequalities: Parents' Education and Respondent's Schooling and Cognitive Skills), returns to education and skills (Earnings Returns to Schooling and Cognitive Skills), and the overall decomposition analyses together with some robustness checks (Education and Cognitive Skills as Mediators of Intergenerational Inequalities in Earnings). Concluding Remarks concludes.

Theoretical Framework and Hypotheses
Inequalities of Educational Opportunities

The influence of parents' education on earnings can be decomposed into two mechanisms: (1) the association between parents' and children's education or cognitive skills and (2) the association between children's education or skills and earnings.[2] Regarding educational inequalities, the growing affluence and employment stability, as well as the reduced income inequalities characterizing the post-war decades, have been put forward to explain the decline in the association between the level of education or the social class of the parents' and children's educational attainment (Breen et al. 2009). Compulsory education legislation, comprehensive education reforms, and increased financial support to less affluent students further contributed to educational equalization (Erikson and Jonsson 1996). Conversely, the stagnation of educational inequalities in more recent cohorts is expected against the background of rising economic and labor market inequalities and of the increased selectivity and internal stratification of educational systems (Barone and Ruggera 2018).

Empirical studies of trends in educational inequality focus on (vertical measures of) educational attainment. It has been noted, however, that in a context of mass education, student skills display a marked variability at any educational level (Arum and Roksa 2010). The financial, human, and educational resources available to schools and universities are highly unequal, with important implications for student learning outcomes. Moreover, schools and universities differ in their social intake with implications for the signaling value of their credentials depending on the characteristics of national educational systems and labor markets (Gelbiser 2021). School and university rankings enjoy increased visibility in several western countries, while school choice and accountability policies have been introduced with the stated purpose of increasing the efficiency of educational systems (Braga et al. 2011). Furthermore, upper secondary and tertiary education is increasingly differentiated, with a growing supply of programs of varying quality and an emergent divide between the university pillar and vocational higher education (Arum and Roksa 2010; Shavit et al. 2007). Owing to their higher financial, cultural, and social resources, highly educated families are better equipped to navigate these increasingly differentiated educational systems. Hence, their children are overrepresented in more selective and better performing schools and tertiary programs, which in turn thus signal their "upper class profile." Highly educated families may thus react to the massification of educational credentials by preserving a competitive skill advantage (Lucas 2001). Social inequalities in skill development may therefore be more resistant to change than inequalities in educational attainment.

Moreover, when considering adult workers, intergenerational inequalities in skill accumulation processes in education are reinforced by labor market dynamics. Higher skilled workers are assigned to more skill-enhancing job tasks and are offered better formal and informal training opportunities, thus fostering skill inequalities over the life course (Barone and van de Werfhorst 2011; Blossfeld et al. 2014). These cumulative skill inequalities can represent a powerful countervailing influence attenuating the impact of educational equalization. Based on these arguments, we formulate the following hypotheses:

H1a: The association between parents' education and children's educational attainment in the adult population has declined between 1994 and 2015.[3]

H1b: The association between parents' education and children's cognitive skills in the adult population has remained stable between 1994 and 2015.

The Earning Returns of Education and Cognitive Skills

Moving to the association between education or cognitive skills and earnings, the economic literature is dominated by the hypothesis of skill-biased technological change (SBTC), which was formulated to explain the rising returns to college degrees in the United States from the mid-1970s to the 1990s, despite the secular increase in the supply of college-educated workers. Some influential studies argued that the increase in the relative demand for skilled workers fostered by technological change was the primary cause of these increased returns to education and especially of the increased wage gap between college and high school graduates. New technologies would replace routine tasks while disproportionally enhancing the productivity of highly skilled workers (Acemoglu and Autor 2011; Autor, Kats, and Kearney 2008). It follows from this view that both educational attainment and cognitive skills have become increasingly important determinants of labor market success.

SBTC may be described as an economic reformulation of modernization theories (Bell 1973; Treiman 1970) predicting growing returns to education in knowledge societies. However, while both perspectives predict a secular increase in the relative demand for highly skilled workers, the SBTC hypothesis argues, more specifically, that computer-based innovations have fostered a rapid acceleration of this trend since the 1980s (Acemoglu and Autor 2011). Moreover, contrary to the optimistic predictions of modernization theory, the SBTC hypothesis predicts growing labor market polarization and growing wage inequalities. New technologies are supposed to complement non-routine tasks, which are more often performed by both high- and low-skilled workers, while they substitute the routine tasks typically performed by medium-skilled workers. Based on the hypothesis of SBTC, we can formulate the following hypotheses:

H2a: The association between educational attainment and earnings has increased in the adult population between 1994 and 2015.

H3a: The association between cognitive skills and earnings has increased in the adult population between 1994 and 2015.

However, the empirical evidence suggests that the SBTC hypothesis may fall short of explaining changes in returns to education and cognitive skills in western countries (Card and Di Nardo 2002). First, while earning returns to education suddenly rose in the 1980s and continued to rise until the early 2000s in the United States as well as in Canada, several studies have documented a stabilization of the wage premium of education in these countries since 2005, despite continuing advances in (and spread of) computer technologies (Ashworth and Ransom 2019). Furthermore, while college graduates enjoyed increased chances of obtaining high-skilled jobs in the United States during the 1990s, this pattern has reversed for the cohorts entering the labor market in the following two decades (Beaudry, Green, and Sand 2014). While most of the studies on SBTC focus on economic returns to schooling, for the United States some trend analyses on returns to cognitive skills point to declining returns since the 2000s (Acemoglu and Autor 2011; Beaudry, Green, and Sand 2014; Castex and Dechter 2014; Green 2006).

Moreover, the evidence for several European countries indicates that the introduction of new technologies in the 1990s was not followed by rising economic returns to education. The college wage premium initially increased in the 1980s in the UK but then stayed unchanged between 1993 and 2016, a period marked by a rapid increase in college graduation rates (Blundell et al. 2016; Silles 2007; Walker and Shu 2008). In addition, an excess supply of highly educated workers

has been invoked to explain declining returns to education since the mid-1990s in other rich countries such as Germany (Boockmann and Steiner 2012), Japan (Ishida and Slater 2010), and Spain (Bonhomme and Hospido 2017). A comparative analysis of twelve European countries reported a generalized decline in economic returns to education in recent decades resulting from an increased relative supply of highly educated workers (Crivellaro 2016).

Several studies have thus questioned the validity of the SBTC hypothesis and proposed alternative explanations for trends in returns to education referring to the erosion of centralized bargaining and minimum wage legislation and welfare state retrenchment (Kristal 2010; Pensiero 2017; Stockhammer 2017), as well as economic globalization and immigration flows (Goldin and Katz 2009). Institutional dynamics and exogenous pressures seem to also contribute to cross-national differences in returns to education (Crivellaro 2016; Liu and Grusky 2013).

This contradicting empirical evidence may speak to a more fundamental problem of the SBTC hypothesis, which relies on the standard assumption of human capital theory that educational attainment acts as a proxy for workers' cognitive skills such as reasoning, literacy, and numeracy skills (Liu and Grusky 2013). However, recent changes in work organization may promote a growing importance of other types of skills. Employers exert greater pressure on employees to expend more effort (Felstead and Green 2017; Green et al. 2021) and monitor employees' performance more closely (Gallie et al. 2004). Hence, employees' traits that are more responsive to these intensified demands and that facilitate trust—also called incentive-enhancing traits (Bowles, Gintis, and Osborne 2001)—may become increasingly important, as documented by several recent studies (Edin et al. 2017; Green et al. 2021; Henseke and Green 2020; Liu and Grusky 2013). Moreover, education effects on earnings may also reflect occupation-specific technical skills together with general cognitive and non-cognitive skills (Alon 2018; Barone and van de Werfhosrt 2011; Bell 1973). Then, if vocational programs in secondary education decline or become less skill-specific, while the specialization of tertiary programs increases (Alon 2018), returns to tertiary education can increase even if cognitive skills do not become more relevant for earnings. Hence, the effects of educational qualifications on earnings and the related time trends may not parallel skill effect and trends. This decoupling of the respective trends for returns to education (H2a) and to skills leads to the following hypothesis:

H3b: The association between cognitive skills and earnings has stayed stable in the adult population between 1994 and 2015.

Contrary to human capital theory, signaling models suggest that education affects earnings primarily because it signals workers' talent, career orientations, and other individual traits that matter to employers, but that they cannot easily measure in the context of standard hiring procedures (Spence 1973). However, education is a signal that can be manipulated, for instance by attending less selective schools and universities, thus resulting in uncontrolled educational expansion (Arum and Roksa 2010; Spence 1973). Hence, based on signaling models, credential inflation and decreasing returns to education are an alternative plausible scenario, which is corroborated by the above-cited studies pointing to declining returns to education in several countries resulting from an excess supply of highly educated workers. These arguments lead to the following competing hypothesis:

H2b: The association between educational attainment and earnings has declined in the adult population between 1994 and 2015.

We can see now why a reduction of social inequalities in educational attainment may not carry over into a reduced influence of parental education on earnings. First, social inequalities in skill accumulation may not decline despite educational equalization (H1a and H1b). If earnings are responsive to cognitive skills, as supposed by human capital theory and SBTC, parents' education

may persistently affect children's earnings. Second, while SBTC predicts that returns to both education and cognitive skills increase over time (H2a and H3a), a broader understanding of education effects referring to non-cognitive or technical skills is compatible with a decoupling of the trends for education and cognitive skills (H3b). Finally, based on signaling models we can expect that credential inflation weakens returns to education (H2b), thus attenuating the effects of educational equalization.

With only fifteen countries and two time points, disentangling the role of institutional factors is challenging. Hence, we refrain from formulating country-specific hypotheses. However, based on comparative social stratification research, we can expect that educational equalization was strongest in Scandinavian countries (Sweden, Norway, Finland, and Denmark), which have promoted the most comprehensive educational and welfare reforms (Esping-Andersen 2015; Hertel and Groh-Samberg 2019). Moreover, centralized bargaining and minimum wage legislation in these countries have compressed earning inequalities and earning returns to skills and schooling (Western and Rosenfeld 2011). Conversely, the increased selectivity and the implementation of accountability policies in educational systems, labor market deregulation, and welfare retrenchment were strongest in the United States, Chile, and the other English-speaking nations (England, Northern Ireland, Ireland) of our country sample, resulting in growing income inequalities and stronger pressures toward large and persisting intergenerational inequalities (Braga et al. 2011) as compared to continental European countries (Italy, Slovenia, Czech Rep, Germany, and the Netherlands in our country selection).

As mentioned above, the evidence needed to adjudicate between the alternative hypotheses formulated in this section is remarkably scant. The study coming closest to these concerns was carried out by Gregg et al. (2017), who attempted to analyze the mediating role of education for the intergenerational persistence of income in comparative perspective. Using data for the United States, the UK, and Sweden, they rejected the hypothesis that differences in inequality of educational opportunities or in returns to education explain the higher level of intergenerational persistence found in the United States and UK. In the next sections, we present our data and analytical design.

Data and Variables

We use data from IALS (1994–1998) and PIAAC (2011–2015). These two large-scale, cross-national surveys offer three important advantages. First, they collect detailed information on literacy and numeracy skills measured with high-quality standardized tests, earnings, and other labor market outcomes, as well as parents' education. Second, they display a high degree of comparability across countries and over time. This is a major advantage over studies based on ex-post harmonization procedures. IALS and PIAAC have 60 percent of items in common in the literacy domain. This commonality was exploited to rescale the IALS data into the new PIAAC literacy test scores that we use as our preferred indicator of respondent's skills. IALS and PIAAC contain measures of numeracy as well, but there is no overlap between the numeracy scales in the two surveys. Importantly, the correlation between the literacy and numeracy scales in IALS is very high, indicating that they capture the same underlying cognitive skills dimension.[4] The only relevant difference between these two surveys is that IALS administered paper-based tests, while PIAAC switched to a computer-based format. Moreover, the high degree of comparability across countries and among these two surveys involves also the other key variables used for the analyses, namely, parents' education and respondent's education and earnings.

A third major strength of these data is that both surveys are based on high-quality research practice. For instance, country teams could choose their preferred sampling design and contact approach as long as they were based on probability sampling methods (OECD 2013).

Both surveys draw samples of non-institutionalized adults aged 16 to 65. Our analytical sample consists of employed respondents aged 30 to 60, to screen out respondents in education and to reduce biases due to selective mortality correlated with education and skills. Since we

lack plausible instrumental variables to model selection into employment, our conclusions are restricted to employed individuals.

The outcome of interest is gross earnings, which is the only earnings measure common to IALS and PIAAC. Moreover, net earnings seem less relevant to our study given our focus on labor market returns to education and skills. Germany is the only exception as earnings data for this country in IALS are available only as net figures; hence, we use the same type of measure also for PIAAC. Information on earnings was collected using highly similar formats across the two surveys, asking respondents to report their estimated earnings. These self-reported measures are prone to some degree of unreliability, and, at any rate, they cannot be taken to reflect permanent earnings (Angel et al. 2019; Micklewright and Schnepf 2010). However, to the extent that any potential bias is similar across the two surveys given the similarity of their research designs, comparisons over time should not be affected. Moreover, yearly fluctuations of economic returns to education in relation to economic cycles are of small magnitude according to a recent review of the evidence (Psacharopoulos and Patrinos 2018). For countries participating in IALS 1998 and in PIAAC, earnings data are available both as quintile categorical variables and as continuous variables, while for the countries of IALS 1994 this information is only available in quintiles. To ensure comparability over time, we use the quintile measure and analyze it using interval regression, as explained below. In the Appendix B1, we will comment on the results based on the continuous measure for a subsample of countries. We use earnings values in PPP, adjusted for inflation and log-transformed in order to interpret the estimates as percent changes. The boundaries for earning quintiles are available from the IALS and PIAAC survey documentation for most countries.[5] Combining countries with information on earning quintiles for both IALS and PIAAC, we obtain a sample of fifteen countries.

Respondent's education is measured in years of completed schooling (not counting repeated grades). While this metric variable provides an acceptable solution in terms of cross-national comparability and captures a large part of the education effects on earnings (Schneider 2010), it fails to incorporate some relevant horizontal differences between educational qualifications (e.g., academic vs. vocational diplomas; differences between tertiary fields of study). The share of tertiary graduates is too small in some countries to adopt a categorical approach (e.g., modeling tertiary attainment separately). Therefore, in the main analysis, we modeled education as a continuous variable in the interest of statistical power. However, returns to education could change over time in three distinct ways: highly educated individuals experience an increase/decrease in their earning prospects compared to medium-educated individuals, or the latter experience a change compared to lower-educated workers, or both. We present the results of an analysis using a categorical specification in Appendix B3.

Parents' education is available in the seven main categories of the 1975 and 1997 ISCED classifications, respectively, for IALS (UNESCO 1976) and PIAAC (UNESCO 1997). This variable has been recoded into years of education equivalents and averaged across parents. With this specification, we assume that the relationship between parents' education and children's outcomes is linear (Herts et al. 2007). An alternative categorical approach based on educational qualifications can relax this assumption. Chevalier et al. (2009) used the five-category version of ISCED to estimate intergenerational correlations for education in Europe and the United States. Blanden (2013: 45) "compares the results from Chevalier et al. (2009) with those from Herts et al. (2007) and finds a moderate correlation of 0.49, implying common ground between the two approaches." Indeed, we have checked that models adopting a categorical approach for parents' education (tertiary, upper secondary, lower secondary degree, or less) lead to similar substantive conclusions while displaying much lower statistical power.[6]

Unfortunately, neither IALS nor PIAAC contain information on parents' occupation or income. Hence, our results cannot be extended to these additional dimensions of family background. It should be noted that parents' education is the dimension of family background that is most predictive of children's cognitive skills and educational attainment (Erola et al. 2016) and that it has long-lasting effects on earnings (Yaish et al. 2021). Moreover, the estimation of the total

effect of parents' education is not biased by the omission of parents' occupation or income, as these variables are mediators of parents' education. Educational attainment is also more stable over the life course than occupation or income (Blanden 2013).

A second data limitation is that sample size varies considerably across countries and does not allow some more fine-grained analyses. In particular, we cannot test for gender differences in time trends nor whether returns to education and skills vary by parents' education. Estimates uncertainty for these three-way interactions terms would be too large. Moreover, even with the parsimonious modeling specification described below, estimates uncertainty is quite large for a few countries in some analyses, as pointed out in the comments on the results.

Control variables include age, age squared, gender, and country of birth.[7] We complement this specification with birth cohort in supplementary analyses presented in the Appendix B4. We account for survey design effects using the replicate weights included in the official data releases. We use the Stata module "repest" to consider both the plausible skill values and the survey design (Avvisati and Keslair 2020).

Statistical Models

Our dependent variable has interval censoring, that is, we know the quantile category into which each respondent's earnings fall, and we know the boundary values of each quantile, but we do not know the exact value of their earnings. Interval regression is the optimal model for this type of data (Stewart 1983). Contrary to OLS regression on the midpoints of the intervals, it takes uncertainty concerning the exact values within each interval into account, and it deals adequately with left- and right-censoring in the tails.

We analyze to what extent the total association between parents' education and respondent's earnings is mediated by respondent's education and cognitive skills across the two surveys. We estimate models separately by country and data source (IALS and PIAAC). We use the product method to quantify indirect effects. When both the outcome and the mediator variables are continuous, this method holds the same results as the difference method (Van der Weele 2016). To compute the standard errors for these indirect effects, we use the estimator proposed by Sobel (1982, 1986), which is based on the multivariate delta method using a first-order Taylor series approximation:

$$\sigma_{\alpha\beta \text{ first}} = \sqrt{\alpha^2 \sigma_\beta^2 + \beta^2 \sigma_\alpha^2}$$

The coefficient for the intervening variable is divided by the standard error and then compared to a normal distribution to test for statistical significance. We use the z-test to assess the statistical significance of differences between PIAAC and IALS in the estimated indirect effects (Clogg, Petkova, and Haritou 1995):

$$Z = \frac{\beta_1 - \beta_2}{\sqrt{(SE\beta_1)^2 + (SE\beta_2)^2}}$$

We identify trends over time describing period effects estimated by comparing PIAAC and IALS, under the assumption that survey effects are negligible or non-systematic given the high degree of comparability between these two data sources. These estimated period effects can result either from cohort replacement or from genuine period effects reflecting, for instance, economic cycles (Breen and Jonsson 2007). Changes in educational attainment and in the related social inequalities can be interpreted as predominantly cohort effects unless adult education is widespread, while changes in earning returns to education and cognitive skills can reflect a mixture of period and cohort effects. While we control for age effects, we cannot disentangle period and cohort effects with our data. By comparing the two surveys, we take a period perspective following

recent practice in mobility research (cf. Breen and Muller 2020) that documents the relevance of period effects for labor market outcomes. However, for the analysis of educational inequalities, we also took a cohort perspective, and we will report some supplementary results based on the comparison between three birth cohorts across the two datasets in Appendix B4.

Our results are purely correlational. For instance, the estimated associations between parents' education and respondent's earnings may be partly biased by omitted genetic confounders, and the same remark applies to the associations between education or skills and earnings. This limitation is common to most studies on trends over time in intergenerational correlations, and we unfortunately cannot overcome this problem with the data at hand. Moreover, IALS and PIAAC are cross-sectional surveys measuring skills and earnings at the same point in time. While causality most likely runs from cognitive skills to earnings rather than vice versa, we cannot completely exclude reverse causality and, more importantly, selection into occupations may affect both. At the same time, controlling for respondent's occupation would induce overcontrol bias since education and skills affect occupational attainment. In the Appendix B2, we comment on the results of models controlling for respondent's occupation at the time of the interview, following the specification of Barone and van de Werfhorst (2011). This robustness check as well as those mentioned above confirm the main patterns of findings reported in the next section.

Results

We will first present results on the total effect of parents' education on children's earnings and assess the related variations across countries and over time (Intergenerational Inequalities: Parents' Education and Respondent's Earnings). Then, we will examine the relationship between parents' education and respondent's education or cognitive skills (Educational Inequalities: Parents' Education and Respondent's Schooling and Cognitive Skills), earning returns to education and cognitive skills (Earnings Returns to Schooling and Cognitive Skills) and, finally, the results of the decomposition analyses and of some robustness checks (Education and Cognitive Skills as Mediators of Intergenerational Inequalities in Earnings). The descriptive statistics are reported in Appendix A. Unless specified otherwise, we comment on time trends only when they are statistically significant.

Intergenerational Inequalities: Parents' Education and Respondent's Earnings

Figure 1 reports the estimated associations between parents' education and respondent's earnings in 1994 (blue circles) and 2015 (red triangles). The arrows refer to the direction of time trends, and the results of the significance tests for these time trends are reported using stars beside country labels. The coefficients refer to the earnings percentage increase associated with an additional year of parents' education. On average across these countries, one additional year of parents' education is associated with a 4.6 percent increase in children's earnings in both 1994 and 2015. This strong degree of intergenerational inequality is consistent with the results of previous studies that used parents' education (Bratsberg et al. 2007; Heckman and Hots 1986; Liu et al. 2000).

Country-level estimates confirm that this association is both large and highly stable over time across most countries. In Scandinavian countries and the Netherlands, the influence of parental education looks comparatively small (average of 4.2 percent in 1994 and 2.5 percent in 2015) and we detect an overall tendency toward a decline over time, but this trend is large and statistically significant only in Norway (from 6.5 to 3.2 percent). Conversely, the United States is the country displaying the largest earning differentials associated with parents' education in PIAAC, together with Chile, and it is the only country where we detect a substantial and statistically significant increase in intergenerational inequalities (from 4.1 to 8.5 percent). The point estimates also suggest a non-significant increase over time in Chile and Germany,[8] while for the other countries they display a pattern of stability and we do not detect any statistically significant time trend.
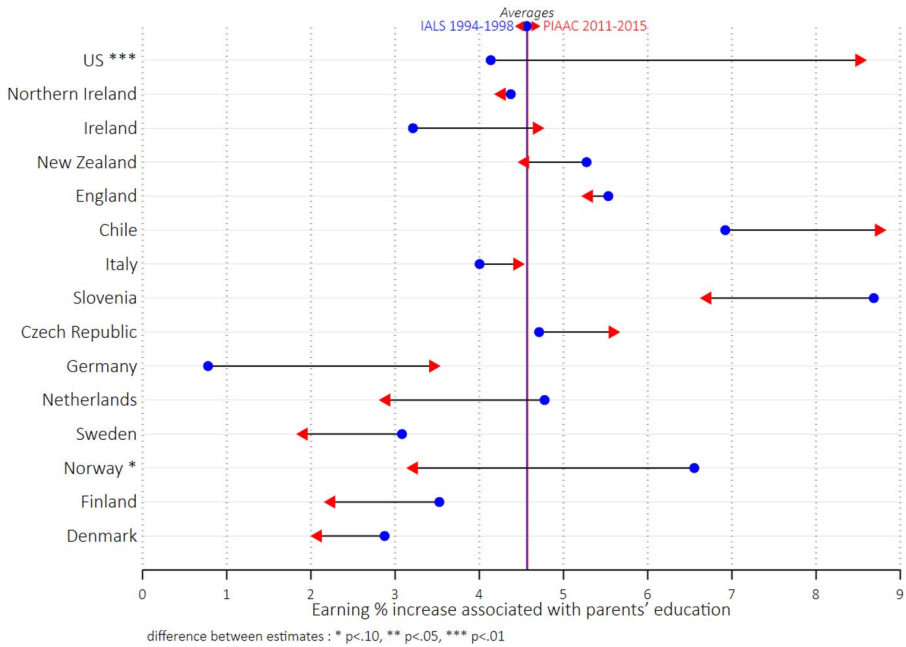
Figure 1. Earnings percent increase associated with parents' education in IALS (1994–1998) and PIAAC (2011–2015). Earnings values are in PPP, adjusted for inflation and log-transformed to interpret the estimates as percent changes. Parents' education is measured as years of education equivalents derived from ISCED classifications (UNESCO 1976 for IALS and UNESCO 1997 for PIAAC) and averaged across parents.

The overall levels of intergenerational inequality do not systematically differ between continental Europe and English-speaking countries, a finding that brings out even more clearly the peculiarity of the United States in a comparative perspective (Björklund and Jäntti 1997; Jäntti et al. 2006; Solon 2002).

Educational Inequalities: Parents' Education and Respondent's Schooling and Cognitive Skills

Let us now move to the analysis of educational inequalities, as reflected in the association between parents' education and respondents' education or cognitive skills.

The upper panel of figure 2 indicates that one more year of parents' education is associated with 0.52 and 0.40 years of education in the next generation in 1994 and 2015, respectively, thus pointing to strong but moderately declining schooling inequalities. Scandinavian countries and the Netherlands display below-average levels of schooling inequality in 2015 as well as systematic declines over time, which are statistically significant for all of these countries. The United States are again an outlier, as the only country displaying a high level of schooling inequality and a statistically significant increase of inequality over time (from 0.44 in 1994 to 0.54 in 2011). In line with previous research (Barone and Ruggera 2018; Braga et al. 2011), inequalities in educational attainment are high in PIAAC in Chile, Italy, and in the two highly stratified educational systems of Germany and the Czech Republic. Overall, the relationship between parents' and children's education declines significantly over time in the majority of countries, but not in Germany, Italy, and Chile that continue to display high levels of schooling inequality in 2015 and in the United States where schooling inequalities increase.
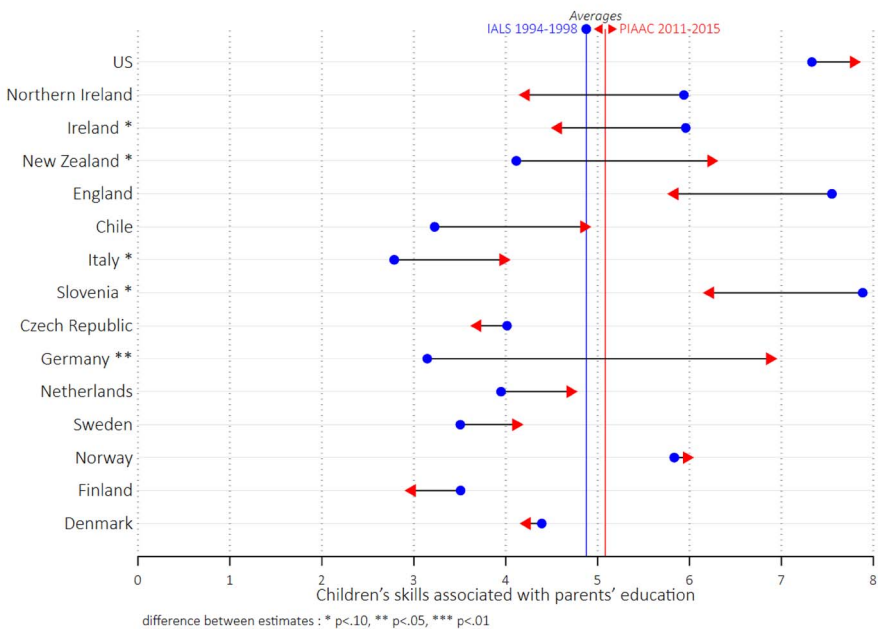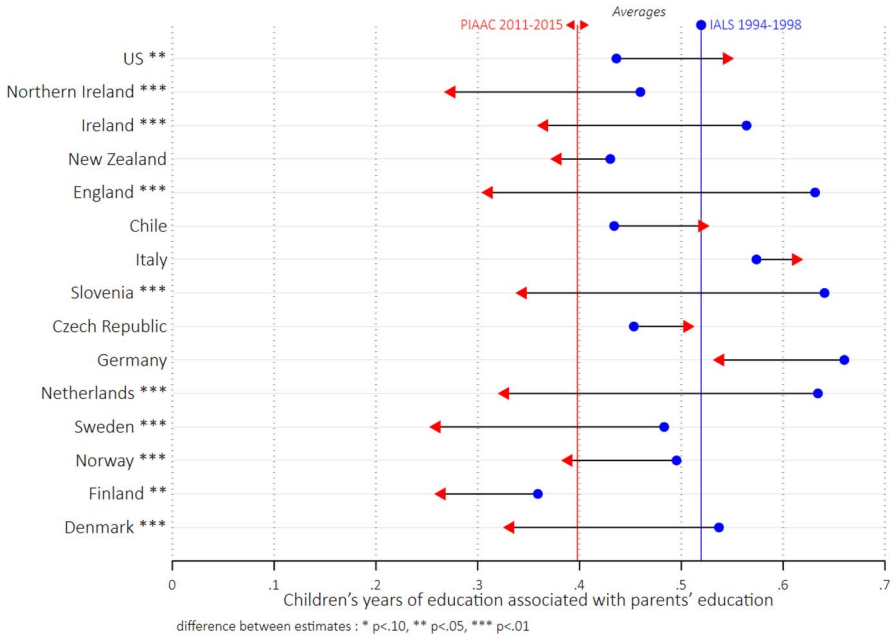
Figure 2. Years of education and literacy skills scores associated with parents' education in IALS (1994–1998) and PIAAC (2011–2015). Respondents' years of education is measured as years of completed schooling (not counting repeated grades). Literacy skills are measured as the plausible values on the literacy test of the IALS and PIAAC assessments.

The bottom panel of figure 2 plots the changes in the association between parents' education and respondents' skills at the time of the interview. Every additional year of parents' education is associated with roughly 5 additional points in respondent's literacy scores in both IALS and PIAAC. Hence, the skill gap corresponding to a 5-year difference in parents' education (roughly equivalent to the difference between a master and a high school degree) is 25 points, which is approximately half of a standard deviation of the literacy score. Social inequalities in skill accumulation are again below-average in all Scandinavian countries apart from Norway, while they are comparatively large in the United States, England, New Zealand, Germany, and Slovenia.

For this outcome, we do not detect the pattern of equalization observed for respondents' schooling. Only Slovenia and Ireland display a statistically significant weakening association, and only New Zealand, Germany, and Italy display the opposite trend, which is of substantial magnitude (from 3 to 7 point scores) only in the case of Germany. For the majority of countries, both the point estimates and the significance tests indicate an overriding stability. While skill-based inequalities did not increase over time in the United States, this country stands out as the most unequal in 2015.

Overall, skills gaps are largely stable over time, while schooling gaps display a declining trend, particularly for Scandinavian countries and several English-speaking nations, with the United States also being an outlier in this respect. These patterns lend empirical support to hypotheses 1a and 1b, which refer, respectively, to the reduction of schooling inequalities and the stability of skill inequalities. Hence, in most countries educational equalization did not carry over into skill equalization across these two decades.

Earnings Returns to Schooling and Cognitive Skills

In this section, we assess the evolution of earnings returns to education and cognitive skills. When assessing the former, we do not control for the latter, and vice versa. On average, a one-point increase in the skill scale is associated with a 0.35 percent increase in earnings in 1994 and 0.34 in 2015, as reported in figure 3. Earnings returns to skills are comparatively small in Scandinavian countries and exceptionally high in the United States, followed by the other English-speaking countries.

The association between cognitive skills and earnings displays a high degree of stability over time with small, non-significant variations for the majority of countries. This association weakens substantially and significantly only in Chile (from 0.61% to 0.41%) and Finland (from 0.44% to 0.28%); the point estimates suggest some milder and non-significant declines also in Northern Ireland (from 0.47% to 0.38%) and Slovenia (from 0.40% to 0.32%). Only in the United States we detect a substantial and statistically significant increase in the association between skills and earnings (from 0.29% to 0.52%); the point estimates suggest a milder increasing trend also for Germany (from 0.30% to 0.44%), which is not statistically significant, possibly because of a lack of statistical power.

In Appendix B5, we report the results concerning returns to skills when controlling for respondent's education. The effect sizes are substantially smaller (0.2% in both 1994 and 2015), which implies that the correlation between skills and earnings is partly due to the association between education, skills, and earnings. Our conclusion concerning the overall stability over time of earnings returns to skills is robust to this alternative specification, which holds less statistical power to detect changes over time. Overall, hypothesis 3a referring to SBTC is rejected in favor of hypothesis 3b.

The bottom panel of figure 3 shows that economic returns to schooling are comparatively low in Scandinavian countries and large in the United States, Chile, and Slovenia. The association between schooling and earnings has grown stronger for a large number of countries. On average, every additional year of education was associated with a 6.5 percent increase in earnings in 1994 and an 8.3 percent increase in 2015. In ten countries out of fifteen, this association has become significantly stronger. Moreover, in Denmark, Italy, and the Czech Republic the trend is not statistically significant but point estimates move in the same direction of increasing returns.
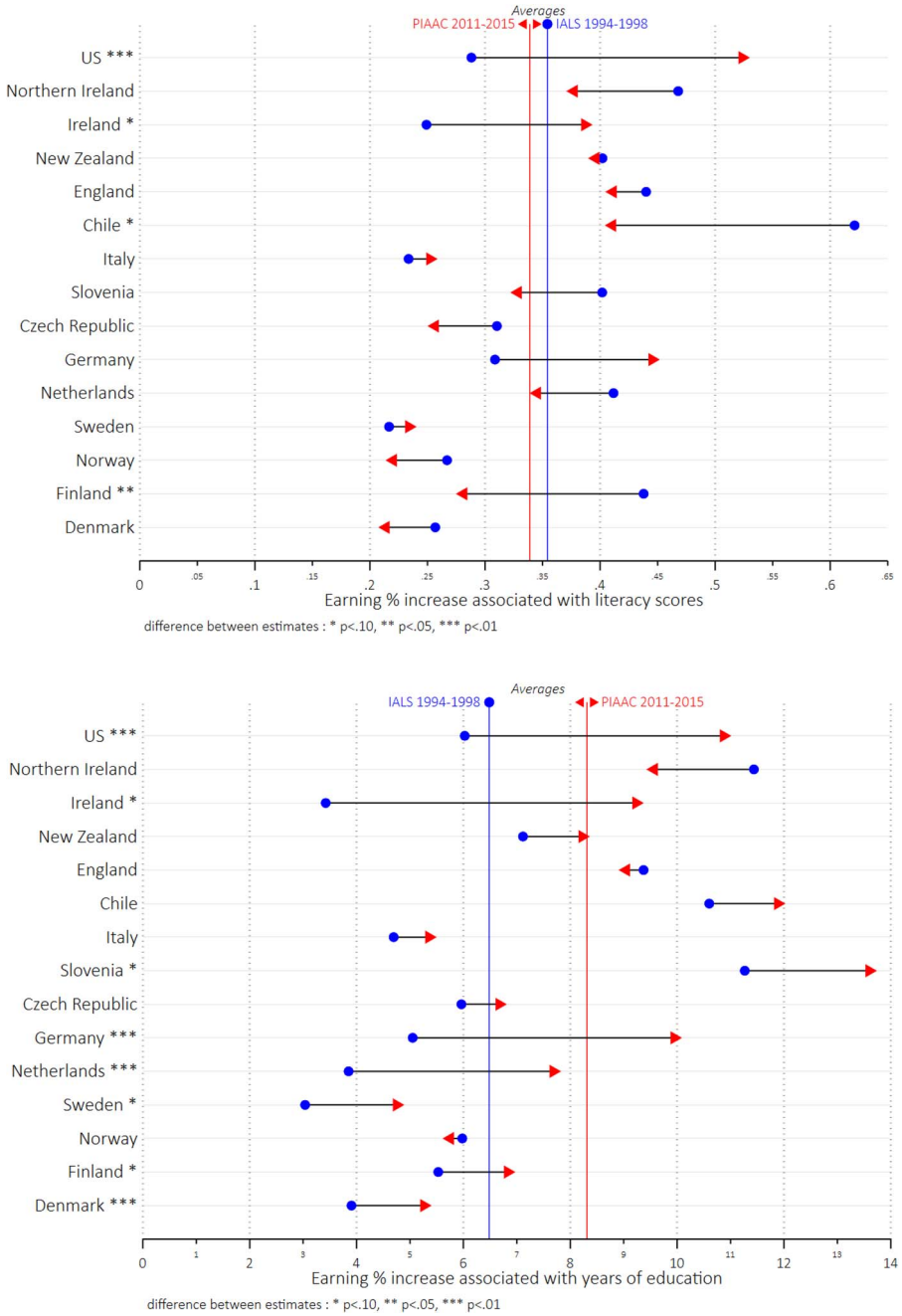
Figure 3. Earning percentage increase associated with literacy skills scores and years of education. IALS (1994–1998) and PIAAC (2011–2015) data. Earnings values are in PPP, adjusted for inflation and log-transformed to interpret the estimates as percent changes. Literacy skills are measured as the plausible values on the literacy test of the IALS and PIAAC assessments. Respondents' years of education is measured as years of completed schooling (not counting repeated grades).
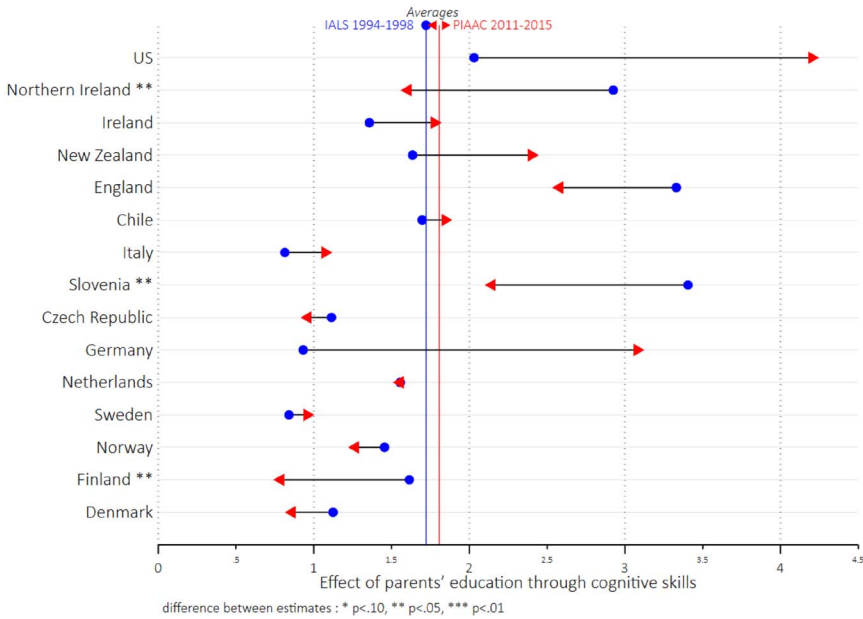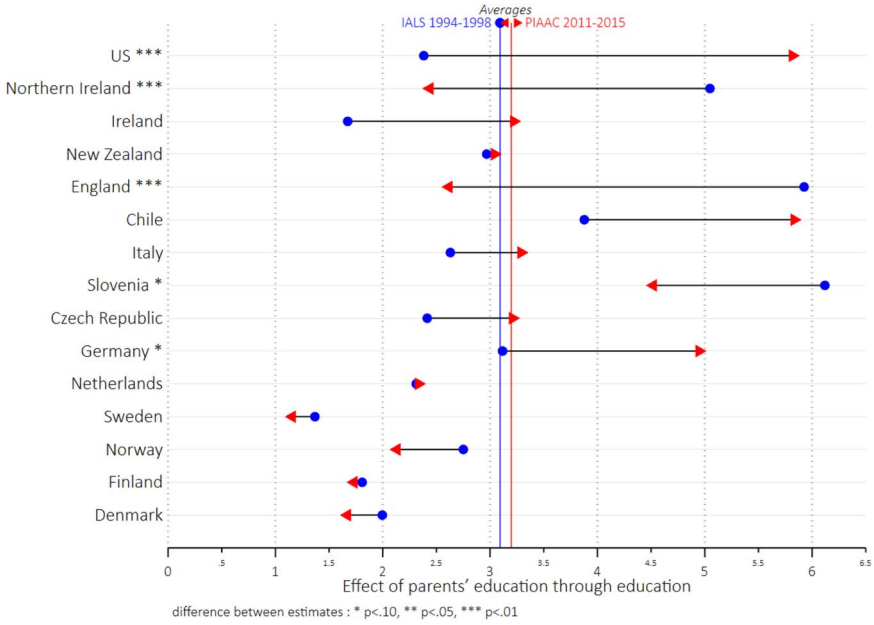
Figure 4. Effect of parents' education on earnings through literacy skills scores and years of education. IALS 1994–1998 and PIAAC 2011–2015 data. Parents' education is measured as years of education equivalents derived from ISCED classifications (UNESCO 1976 for IALS and UNESCO 1997 for PIAAC) and averaged across parents. Literacy skills are measured as the plausible values on the literacy test of the IALS and PIAAC assessments. Respondents' years of education are measured as years of completed schooling (not counting repeated grades).

Overall, there is strong evidence of a generalized increase in earning returns to schooling. This finding contradicts hypothesis H3b based on signaling models, and it is instead compatible with both SBTC and the hypothesis of an increased importance of technical skills or incentive-enhancing traits (H2a).

Overall, the reduction of social inequalities in educational attainment characterizing the majority of countries is accompanied by an increase in returns to education. The United States is again an outlier since the substantial increase in educational inequalities and in returns to education promotes an increase in intergenerational inequalities. The results for educational attainment are thus starkly different from those for literacy skills, which do not display any generalized trend.

Education and Cognitive Skills as Mediators of Intergenerational Inequalities in Earnings

Let us now move to the analysis of changes in the indirect effects of education and cognitive skills resulting from changes in their associations with parental education or earnings. We can thus separately assess whether and how the role of education and cognitive skills as mediators of intergenerational inequalities has evolved over time.

Figure 4 reports the earnings percentage increase associated with parents' education operating through respondent's cognitive skills (upper panel) and education (bottom panel). Overall, in IALS, every additional year of parents' education is associated with a 1.7 percent increase in respondent's earnings operating via cognitive skills, and in PIAAC the corresponding value is 1.8 percent, thus confirming that the mediating role of skills does not display any systematic trend over time, in line with the results reported in the previous sections. Only in three countries out of fifteen (Northern Ireland, Finland, and Slovenia) this indirect effect weakens significantly. In the United States and Germany, we observe large increases (from 2 to 4.2 and from 0.9 to 3.1, respectively), which results from growing returns to skills in the United States and from growing inequalities in skill accumulation in Germany. For the other ten countries, the point estimates and the confidence intervals indicate an overriding stability, mostly resulting from both stable social inequalities and earnings returns.

Across all countries, the indirect effect of parents' education via schooling is stable between IALS (3.1 percent) and PIAAC (3.2 percent). This roughly corresponds to two thirds of the total effect of parents' education, in line with previous research (Bernardi and Ballarino 2016). The mediating role of schooling is approximately twice as large as that of cognitive skills, indicating that the former reflects some mechanisms of intergenerational inequality operating regardless of cognitive skills. Stability over time is the dominant pattern at the country level. In the United States and Germany this indirect effect increases significantly and substantially from 2.4 to 5.8 and from 3.1 to 4.9, respectively, but Chile displays a sizable increase too, although its trend does not reach statistical significance, possibly because of insufficient statistical power. In Northern Ireland and Slovenia, we detect a significant decline of the indirect effect of education, while in all the other countries stability prevails. This predominant stability implies that the declining inequalities in educational attainment by parental education were compensated by growing returns to schooling, which primarily benefited individuals from highly educated families, who were more likely to achieve tertiary degrees.

In these analyses, we have presented the separate contributions of education and cognitive skills to intergenerational inequalities in earnings, and we have seen that across all countries the indirect effect of education was 3.1 in 1994 and 3.2 in 2015. When incorporating cognitive skills together with education, these values rise, respectively, to 3.5 in 1994 and 3.7 in 2015. Hence, cognitive skills add only to a limited extent to the explanatory power of schooling.[9]

Concluding Remarks

This article analyzed the evolution of the role of schooling and cognitive skills as mediators of intergenerational inequalities in economic outcomes. Using data based on the harmonization of

two high-quality and highly comparable large-scale surveys carried out by the OECD, namely, IALS and PIAAC, we analyzed how the association between parents' education and earnings changed between 1994 and 2015 in fifteen countries, covering a broad variety of economic and institutional contexts. We found that this association is large and highly stable over time in most countries. In Scandinavian countries and the Netherlands, this intergenerational correlation is comparatively low in 2015 and we detected a systematic tendency toward declining inequalities between 1994 and 2015, which is statistically significant for a majority of these countries. Conversely, the United States stands out as the country displaying the largest earnings differentials by parents' education together with Chile and as the only country where these differentials increased over time. Interestingly, the overall levels of intergenerational inequality do not differ in any systematic way between continental Europe and English-speaking countries, a finding that brings out even more clearly the American exceptionalism in comparative perspective (Björklund and Jäntti 1997; Western and Rosenfeld 2011; Solon 2004). The United States stands out also for the large and increasing educational inequalities together with the comparatively high and increasing earning inequalities associated with workers' skills. These peculiarities are probably interrelated, that is, the high returns to education provide strong incentives to preserve educational advantage. The stakes of being on the "wrong-side" of the educational divide as so large that parental interference on children's education and other attempts to hoard opportunities are probably more rampant in this country.

Educational attainment and cognitive skills are major determinants of earnings. In line with previous research, we found that the association between parents' and respondents' schooling weakened significantly over time in most countries. Educational equalization was more pronounced in Scandinavian countries and in several English-speaking nations, with the United States being again an outlier since this country displayed comparatively high and increasing schooling inequalities. This equalization occurred mainly between the cohorts born in the mid-1930s and in the mid-1960s and flattened thereafter. Period changes between 1994 and 2015 were thus probably driven by cohort replacement in line with previous research (Breen and Jonsson 2007; Breen and Müller 2020).

However, contrary to conventional wisdom, this educational equalization did not carry over into an equalization of earnings prospects by parents' education. By incorporating cognitive skills into the analytical framework of the OED triangle, we could show that the relationship between parents' education and respondent's cognitive skills stayed largely unchanged in most countries. While in a context of educational expansion students from low-educated families could improve their educational opportunities, their counterparts from highly educated families managed to preserve a largely unchanged skill advantage. This decoupling of the trends for schooling and skills is compatible with the hypothesis of effectively maintained inequality (Lucas 2001). Educational attainment has both a quantitative dimension (the number of years of education obtained) and a qualitative dimension (the skills developed in different educational environments). Highly educated families can preserve persistently high advantages vis-à-vis the latter even when quantitative outcomes become less unequal. A second, complementary explanation for the decoupling of trends is that labor market dynamics can reinforce intergenerational inequalities in skill accumulation if, at any given level of education, more privileged students access more skill-enhancing job tasks and are offered better formal and informal training opportunities (Blossfeld et al. 2014). Since we assessed the skills of adult workers, this second argument is equally plausible. Literacy skills correlate with general cognitive ability, which displays high heritability (Briley and Tucker-Drob 2013). This could also contribute to the stability over time of the related social origins differentials.

Moving to labor market outcomes, we found that educational attainment yields increasing earning returns over time in most countries, whilst returns to cognitive skills do not display any systematic trend. The latter result is robust to the inclusion of educational attainment in the models and is consistent with the few available country-level studies (Acemoglu and Autor 2011; Beaudry, Green, and Sand 2014; Castex and Dechter 2014). The decoupling of these two trends

challenges SBTC-based explanations of growing returns to schooling. Education has grown more important for earnings between the mid-1990s and the mid-2010s, but not because of the growing importance of cognitive skills. Other socio-emotional skills and personality traits may have gained importance in relation to the transformations of workplaces, as suggested by the literature on incentive-enhancing traits (Bowles, Gintis, and Osborne 2001), as well as by empirical evidence that social skills have become increasingly relevant predictors of earnings between the 1990s and the 2000s (Green et al. 2021; Deming 2017; Edin et al. 2017). An alternative explanation is that economic modernization fosters an increased relative demand for technical and occupation-specific skills and that the growing specialization of curricula in tertiary education ensures a competitive advantage to highly educated workers (Alon 2018; Liu and Grusky 2013). Since we found that the mediating role of education is larger than that of cognitive skills, and that skills increase the explanatory power of our models only to a limited extent when they are added to educational attainment, the mechanisms operating independently of cognitive skills may play a substantial role for the increasing inequality in the returns to education.

While our data provide a unique opportunity to study intergenerational reproduction dynamics across several countries, they do not contain adequate information to explore the detailed mechanisms driving these trends for educational inequalities (e.g., school quality, type of program attended), nor for returns to education (e.g., personality traits, social skills, technical skills). Moreover, country-level sample sizes are not large enough to explore gender differences in the reported trends. Another limitation of this study is that we could not examine the role of other dimensions of socio-economic background, such as parents' income or social class. A third limitation is that the available measures of earnings are cross sectional and self-reported. They are thus prone to some degree of unreliability (Angel et al. 2019; Micklewright and Schnepf 2010). Studies based on richer measures and larger sample sizes, as well as more time points, are an important avenue for future research.

Overall, we conclude that educational equalization did not result in a reduction of earnings inequalities associated with parental education. On the one hand, intergenerational inequalities in cognitive skills accumulation as well as the related earning returns stayed largely unchanged in a majority of countries. On the other hand, educational equalization was countervailed by increasing inequality in returns to education in several countries. Educational attainment and skills thus continued to mediate largely unchanged intergenerational inequalities.

Endnotes

1. The majority of countries participated in IALS in 1994 and in PIAAC in 2011, but a few countries joined these studies in the following years (1994–1998 and 2011–2015). For the sake of brevity, when referring to these two surveys we will refer to trends between 1994 and 2015.

2. In the social mobility literature, a third potential mechanism of intergenerational persistence involves the so-called "direct effect" of family background on occupational attainment when controlling for respondent's education. While education usually accounts for 80–85% of intergenerational correlations, the residual component may reflect unmeasured dimensions of educational attainment or a variety of labor market mechanisms, such as family's social networks or cultural capital (Bernardi and Ballarino 2016). We refrain from formulating theoretical predictions for this residual association. The analyses of the total effects (Intergenerational Inequalities: Parents' Education and Respondent's Earnings) and of the indirect effects of education and skills (Education and Cognitive Skills as Mediators of Intergenerational Inequalities in Earnings) provide some indications concerning the magnitude of these direct effects across the two surveys.

3. As discussed in sections Statistical Models and Education and Cognitive Skills as Mediators of Intergenerational Inequalities in Earnings, this period trend most likely reflects a cohort change.

4. In IALS the Pearson correlation between measures of numeracy and literacy skills is 0.90 on average and it varies between 0.85 and 0.94 across countries. Hence, using both indicators of cognitive skills for our analyses would considerably reduce statistical power and increase the risk of multicollinearity for the smallest country samples. Based on item response theory (IRT), both IALS and PIAAC consider skills as a latent trait, which can have multiple observed responses called plausible values.

5. For the United States, we recovered the quintile boundaries from the Current Population Survey, which is the most widely used source of information on earnings of the US population. In PIAAC earnings data for Sweden and the United States are reported only in deciles in the Public Use Files. We use information on the median wage of each decile provided in Hanushek et al. (2015).

6. Results available upon request.

7. The results for these control variables, which are in the expected direction, are available upon request to the first author.

8. Germany starts from a very low level of inequality in IALS, possibly owing to the measurement issue mentioned in the section Statistical Models, and to the small sample size for this country in IALS.

9. In PIAAC the R-squared is 0.19 for the pooled model incorporating parents' education and the control variables, 0.22 for the model adding respondent's education, and 0.22 for the model with both education and skills.

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Supplementary Material

Supplementary material is available at *Social Forces* online.

Data Availability

The data underlying this article are available in OCED Survey of Adult Skills (PIAAC) at https://www.oecd.org/skills/piaac/data/; in Statistics Canada International Adult Literacy Survey (IALS) at https://www150.statcan.gc.ca/n1/en/catalogue/89-588-X; and GESIS PIAAC Germany at https://search.gesis.org/research_data/ZA5845?doi=10.4232/1.12660 (Rammstedt et al. 2016), and can be accessed with Programme for the International Assessment of Adult Competencies (PIAAC), Germany—Reduced version ((Data file version 2.2.0) [ZA5845]). Cologne: GESIS Data Archive. https://doi.org/10.4232/1.12660.

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