BERJ | British Educational Research Journal

BERA

British Educational Research Journal
Vol. 42, No. 5, October 2016, pp. 756–779

DOI: 10.1002/berj.3236

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

Andy Green* and Nicola Pensiero
UCL Institute of Education, UK

Research tells us much about the effects of primary and lower-secondary schooling on skills inequality, but we know less about the impact of the next stage of education. This article uses a differences-in-differences analysis of data on literacy and numeracy skills in PISA 2000 and SAS 2011/12 to assess the contribution of upper-secondary education and training to inequalities in skills opportunities and outcomes. It finds that greater parity of esteem between academic and vocational tracks, as found in German-speaking and Scandinavian countries, has some positive effects in mitigating skills inequality. However, the most important factors seem to be high completion rates from long-cycle upper-secondary education and training and mandatory provision of Maths and the national language in the curriculum.

Keywords: apprenticeship; literacy; numeracy; skills inequality; upper-secondary education; training systems

Introduction

Countries vary considerably in the degree of inequality in adult skills and part of this variation can be explained by the characteristics of education systems (OECD, 2010; Green *et al.*, 2015). We know a good deal about the effects on skills inequality of different structures and practices in education prior to the end of lower-secondary schooling. Research suggests that more unequal outcomes are likely to occur in countries when there is early selection, a high proportion of fully privately funded schools, a lack of standardisation in curricula and assessment, and in federal systems where funding is devolved to the regional level (Hanushek & Woßmann, 2006, 2010; Schütz *et al.*, 2008; OECD, 2010). However, much less is known about the contribution of the next phase of education and training to skills distribution and about how different types of provision may affect this.

As we will show in this paper, there is strong evidence that levels of inequality in literacy and numeracy skills change substantially between 15 and 27 years of age, but the direction and degree of these changes vary significantly by country. Which characteristics of education policy and practice are responsible for the different effects has

*Corresponding author: UCL Institute of Education, University College London, London WC1H0AL, UK; Email address: Andy.Green@ioe.ac.uk; Twitter: @LLAKESCentre

been little researched. What research there is suggests, paradoxically, that some of the mechanisms associated with enhanced inequality during the compulsory schooling – such as strong forms of tracking – are not necessarily associated with increases in inequality during post-lower-secondary school education and training (Brunello & Checchi, 2007; Busemeyer, 2014; Green *et al.*, 2015). It may therefore be the case that there are distinctive processes governing the reproduction of skills inequality in different phases of education and training. This study uses a differences-in-differences (DID) analysis of data on literacy and numeracy skills in PISA and the Survey of Adult Skills (SAS), conducted by OECD respectively in 2000 and 2011/12, to analyse the variations across countries in changes in skills inequality between 15 and 27 years of age, and the system characteristics that explain them.

Theories and hypotheses

Much of the comparative work that seeks to explain variations across countries in inequalities in education builds on the seminal work of Raymond Boudon in the 1970s. According to Boudon's (1974) influential 'positional' theory, social stratification has both primary and secondary effects within the education system. Primary effects occur as a result of the transmission of cultural capital within the family, so that children who acquire high levels of cultural capital at home achieve better in schools that value the same forms of cultural capital. Secondary effects occur as a result of children from different backgrounds making different choices within the education system, whereby children from higher-status families, for instance, are more likely to choose pathways that lead to higher-status qualifications than children of similar ability from lower-status families. The first process tends to occur, arguably, in a similar way in all societies and education systems (Jackson, 2013). However, the second process may be more conditional on the nature of the particular education system. As Boudon cogently argued, in societies structured by class and other inequalities, the greater the variety of different routes through the education system – that is, the more 'branching-off' points – the greater the likelihood that socially differentiated aspirations and expectations, engendered from outside the education system, will structure student choices, even in a situation of ostensibly meritocratic access, so that educational opportunities and outcomes will be structured along class, race and gender lines.[1]

In more recently elaborated theories of 'persistent inequalities' in education, elite social groups maintain their educational advantages as education systems expand in two ways. According to the theory of Maximally Maintained Inequality (MMI) (Raftery & Hout, 1993), as a phase of the education systems expands, higher social groups can maintain their advantage so long as their participation in that phase of education grows as fast as, or faster, than that of lower groups. However, when participation by elite students reaches saturation levels then positional competition tends to shift to a higher level of education. At the same time, according to the Effectively Maintained Inequality (EMI) theory (Lucas, 2001), mass provision at the lower level develops more differentiated pathways, increasingly organised into a status hierarchy, with elite students tending to colonise the most prestigious tracks with the best progression routes to higher education.

When applied to upper-secondary education and training, these theories would suggest that differentiated and diverse systems – with more branching points – will be likely to increase inequality both in opportunities and outcomes, whereas more standardised systems will have the opposite effect. Social origins effects will be enhanced in systems with more differentially valued pathways as family-background differences encourage socially stratified patterns of pathway choice. Educational (and skills) outcomes will become more unequal as social segregation in tracks encourages greater differentiation in curricula and aspirational norms across tracks. A recent Special Edition of Oxford Review of Education (Heath & Sullivan, 2011) analyses what has happened to social inequalities in upper-secondary education as this phase of education has been 'democratised' over the past 20 years. In a number of the cases examined, including France and Japan, social inequality has persisted at similar levels, despite massification, through the processes described in EMI theory.

Since literacy and numeracy skills are likely to be affected by the amount of time devoted to the learning of Maths and the national language, we may conjecture that the more unequal the access to learning in these areas, the greater the probability that inequalities in these skills will be maintained or enhanced. Two hypotheses arise from this: (1) that systems that do not mandate the learning of Maths and the national language on all upper-secondary programmes will be more likely to promote skills inequality; and (2) that systems that contain pathways of very unequal durations will have the same effect.

A second hypothesis, deriving from the comparative literature specific to upper-secondary education and training, suggests that tracking may not necessarily have the expected Boudonian effect in the upper-secondary phase. This literature focuses on the so-called 'parity of esteem' between the academic and vocational tracks (Lasonen & Young, 1998; Raffe *et al.*, 1998, 2001) and argues that where this is relatively greater there will be more mitigation of inequality during this phase. Where vocational tracks are of high quality and attract students from across the ability spectrum this is likely to lead to a mitigation of skills inequality. Peer effects are likely to help raise the standards of the lower achievers in the vocational track. Whereas the previous hypotheses are based on the Boudonian assumption that greater standardisation of curricula across pathways will reduce inequality, the parity of esteem argument qualifies the standardisation argument in as much as it allows for certain forms of tracking in upper-secondary education that reduce inequality by virtue of the fact that the pathways are not aligned in a single status hierarchy, as tends to be the case in lower-secondary education.

The comparative literature on upper-secondary education and training tends to distinguish between systems that are highly tracked and those which are more 'integrated' or 'unified'. Lasonen and Young (1998), Raffe *et al.* (1998) and Hodgson and Spours (2014), for instance, posit a continuum from highly tracked systems, to 'linked systems' to 'unified' systems. Tracked systems have high levels of differentiation by institutions, curricula and assessment and qualifications; linked systems are differentiated but have some common elements; and unified systems have no distinct tracks. According to Raffe *et al.* (2001) both unified systems and tracked systems may achieve relative parity of esteem between academic and vocational tracks. Parity of esteem is encouraged in the unified systems by making the structure and nomenclature of the tracks as similar as possible; by introducing common curricula elements, and by maintaining open progression routes so that students can easily switch between tracks, with any track thus providing routes into higher education. Conversely, in tracked systems, the status of vocational education is promoted by 'keeping it separate from the academic track and helping it to develop a distinctive identity and ethos, so that it is not simply judged by the values of the academic track' but also by the distinctive value of its qualifications on the labour market (Raffe *et al.*, 2001, p. 179). On their analysis the relative strengths of these competing rationales will vary according to the context. The unification rationale is stronger where the vocational tradition is weak, but the separation rationale can be stronger where there is a strong vocational tradition, as in the countries with Dual Systems of apprenticeship.

What types of upper-secondary education systems are likely to promote or mitigate skills inequality in respect to the above mechanisms? The literature on upper-secondary education systems as they were in the early 2000s – when our sample from SAS were going through upper-secondary education – identifies four broad types of upper-secondary education and training systems in OECD countries by classifying systems according to their institutional structures, forms of curriculum and assessment and modes of governance and regulation (OECD, 1985; Lasonen & Young, 1998; Raffe *et al.*, 2001; Green, 2000, 2003; Hodgson & Spours, 2014). The country groupings emerging from this bear a close resemblance to the classifications of economies and welfare systems in the comparative political economy literature, with liberal Anglophone countries representing one type, the social market and social democratic countries representing two further types, and southern Europe and East Asia, in some of the literature at least, being accredited with separate though less-distinctive political economy models (see Esping-Andersen, 1990; Hall & Soskice, 2001; Pontussen, 2008; Green & Janmaat, 2011). The connection between the two forms of classification developed in more recent literature should not be surprising since education systems form an integral part of welfare systems in general and since their functioning is substantially affected by the way the external contexts, such as labour market and welfare institutions, interact with them (Green & Janmaat, 2011; Busemeyer, 2014).

Type 1. These are predominantly school-based systems with general academic and vocational provision in different types of dedicated upper-secondary institutions and with apprenticeships representing separate but residual systems. This is the modal type in southern European countries and other western countries influenced historically by the French education system and also, through more complex genealogies, in Central and Eastern European (CEE) and East Asian countries (Green, 2013). Programmes in upper-secondary institutions normally last for three years from the age of 15,[2] as in the original model of the modern French lycée, and end with a qualification that gives access to general university higher education (ISCED 5A) in the case of general education students, and vocational tertiary education (at ISCED Level 4 or 5B) for vocational students. The curricula in different general and vocational programmes share certain common core elements but programmes are typically organised around a cluster of subjects specific to the disciplinary or vocational orientation of programme. Diplomas are normally based on externally administered 'grouped examinations', which require passes in a range of subjects, including core areas of language and Maths. The majority of continental European and East Asian OECD countries have systems of this type (e.g. in our sample, the Czech Republic, Denmark, Estonia, France, Finland, Greece, Italy, Netherlands, Japan, Poland and Russia).[3]

Type 2. These are predominantly comprehensive, school-based systems with academic and vocational provision within the same institution and with apprenticeships either integrated into the school-based vocational programmes (as in Norway) or constituting a separate but residual institutional route (as in the USA). Provision is organised either as a standardised, core plus options programme, as in most North-American high schools, or in differentiated programmes with distinctive subject specialisms but overlapping cores of general education, as in Norway or Sweden. These systems share most of the characteristics of Type 1 systems, but tend to have a higher degree of integration of curricula and assessment across the range of provision (Raffe *et al.* 1998, 2001). They can be regarded generally as relatively standardised on one level – since there is only one main type of upper-secondary institution. However, governance and regulation vary considerably between the USA and Scandinavian contexts, with school choice and diversity policies in the former leading to greater institutional variation than would be found in the more standardised Nordic systems. A number of countries have a few such institutions (eniaia lykeio in Greece; lycées polyvalents in France and tertiary colleges in England), but only four OECD countries in our sample have this type of institution as the dominant institutional form (Canada; Norway; Sweden and the USA). Because of differences in governance and regulation Type 2 systems are best divided between Type 2a for the North-American variant and Type 2b for the Nordic variant.

Type 3. These are systems with participation distributed relatively equally between school-based general education and employment-based Dual Systems of apprenticeship and are found exclusively in social market political economies. In this kind of system the provision at upper-secondary level may be of similar duration across the different tracks, and the vocational track may contain significant mandatory components of general education [as in all Dual System apprenticeships (Solga *et al.*, 2014)]. However, the general and vocational tracks remain very distinctive, with sharp differences in forms of regulation, curricula and assessment, and with clearly differentiated final qualifications and subsequent progression possibilities in education, training and work (e.g. in Germany, university for Abitur graduates from the Gymnasium and Realschule and skilled jobs or higher technical courses for apprentice graduates). In respect of their Dual Systems, Type 3 systems have distinctive forms of regulation based on social partner organisations. This means that apprenticeship systems are closely integrated with labour market institutions and the world of work, and this has important effects on the labour market value of the qualifications they offer and the consequent incentives this provides for apprentices (Busemeyer & Iversen, 2011). A number of countries have traditional Dual Systems of apprenticeship, where provision is regulated by the social partners, and apprentices are recruited by firms and placed on employment contracts (including Austria, Belgium, Denmark, Germany, Ireland, Luxembourg, Netherlands, Switzerland and the UK). But it is only in Austria, Germany and Switzerland where a third or more of young people participate in them (Steedman, 2001, 2010; OECD, 2008, p. 331, Table C1.1).

Type 4. These are 'Mixed Systems', which include many different school- and employment- based programmes of variable length and quality but with dominant academic tracks. Programmes in these systems are often organised on a modular basis, to promote flexible combinations of options. Assessment in general subjects can be through elective single subject awards (as with the English A levels) or, in some cases, by grouped awards that specify a given combination of subjects to be assessed, as in Bachillerato in Spain. On vocational courses students are often assessed on the basis of their ability to demonstrate competences rather than on their knowledge of a syllabus, and programmes often do not have a prescribed duration. Regulation and governance in mixed systems is generally more liberal and market-oriented than in other systems, with much diversity in programmes and types of providers, including private training organisations and, in the case of the UK, private awarding bodies. Systems in this group tend to have higher rates of early school leaving (Eurostats, 2014).[4] Provision broadly conforming to this type can be found in Australia, England, Northern Ireland, Ireland, Scotland, Spain and New Zealand. With the exception of Spain, these countries all belong to the liberal model of political economy identified in the varieties of capitalism literature.

In what ways may the different system types affect the reproduction of literacy and numeracy skills inequality? On the basis of the hypotheses above, we would expect the Type 3 systems to be relatively effective in mitigating skills inequality. They combine relative standardisation in the core skills curricula and duration of programmes, with relative parity of esteem between the general and vocational tracks. Apprenticeship provision is generally considered to be of high quality and the programmes attract a large number of students (sometimes a majority of the age group), coming from across the ability range, including some graduating from the academic Gymnasium or even from university (Schneider & Tieben, 2011). These higher achieving entrants add to the prestige of the vocational system, the quality of its outputs and the value of its qualifications on the labour market, the latter being boosted in addition by strong labour market demand for intermediate skills (Hall & Soskice, 2001). This is likely to raise aspirations and incentivise learning amongst vocational students, which may help to reduce inequality in skills outcomes. In addition, the early entry of apprentices into skilled jobs may enhance their literacy and numeracy skills (Bol & van der Werfhorst, 2013), thus reducing skills inequalities. In Type 1 and Type 2 school-based systems, where academic and vocational programmes are arranged in a monotonic status hierarchy, there is likely to be less parity of esteem between tracks and the incentives for learning in the lower-status vocational tracks may be weaker, particularly in systems that provide no pathways to higher education for vocational students. However, these effects may be mitigated, particularly in the integrated Type 2 systems, by the adoption of standard durations for programmes, a common framework of qualifications and common core-skills learning in different pathways.

In more mixed systems, however, the inequality-mitigating features of Types 1, 2 and 3 systems are often absent. Participation is heavily skewed towards the general academic tracks, which are considered to be of much higher status. Vocational programmes are variable in quality, often short in duration and do not necessarily offer progression routes into higher level programmes or high-quality jobs. Where, as in the UK, there remains considerable labour market demand for low-skills recruits, participants on these programmes may have little incentive to raise their skills levels (Keep & Mayhew, 2014). Furthermore, vocational programmes are typically competence-based, largely oriented towards immediate labour market entry and frequently involve very little general education or continuing study of Maths and the national language. Lower-status vocational tracks often fail to attract students in sufficient numbers to include a broad cross-section of people with different levels of attainment and this, combined with the lack of transparency that comes with system complexity, may mean achievement norms are weakened. These systems are not expected to reduce skills inequalities.

Our focus in this article is on the effects of formal learning rather than informal learning, and on upper-secondary education and training rather than higher education. Higher education is, in our view, unlikely to have a large effect on changes in inequalities in measured literacy and numeracy skills, firstly because the tests probably do not capture fully the higher-level skills that may be acquired by those who attend higher education and, secondly, because in most countries lower attainers still do not attend higher education. Since the variation in skills inequality across countries is mostly due to differences in the distribution in the lowest two deciles of achievement (see: OECD, 2014, Indicator A1.80)—i.e. amongst the groups that miss out on higher education in all countries—variations in participation rates across countries are unlikely to have large effects on variations in skills inequality.[5] Informal learning, on the other hand, may well have an impact on changes in skills inequality, but it is very hard to measure and the available data are limited except in relation to learning at work. We consider the effects of apprenticeships, which are associated with early entry into skilled jobs in which the exercise of literacy and numeracy skills may enhance competence levels and thus affect overall skills distributions. However, we cannot find any robust relationship between youth (un)employment more generally and changes in skills inequality during this phase.[6] To understand the relationship between the patterns of youth employment in different types of work and changes in skills inequality would require considerable further research and is beyond the scope of this paper. The analysis that follows only seeks explore which upper-secondary systems types and characteristics explain the variations across countries in changes in skills inequality between the ages of 15 and 27.

Methodology

To address these questions empirically, we analyse the cross-country variation in changes in skills inequality between 15 and 27 years of age in relation to the differences in post-lower-secondary provision across countries, both in terms of the different system types and the individual characteristics of systems. Since many other relevant factors also differ by country, we use a differences-in-differences (DID) strategy to parse the effects of upper-secondary education and training systems (Card & Krueger, 1994; Hanushek & Woßmann, 2006). Theoretical limitations and data availability make it very likely that some relevant factors are omitted in our analysis. Given these limitations, an OLS (ordinary least squares) estimator or a simple mean comparison of inequality at age 27 are likely to be biased as they do not take into account systematic differences between countries at the beginning of upper-secondary phase. The advantage of the DID estimator is that it controls for omitted systematic (time-constant) factors that are likely to affect the level of inequality over and above the impact of the independent variable.

The DID estimator is defined as the difference in average inequality in the treatment group before and after treatment minus the difference in average inequality in the control group before and after treatment (equation 2). In other words, it consists of comparing the over-time change in inequalities across groups of countries, for example, countries with a dual apprenticeship and countries with a differentiated system. The impact of the dual system can then be estimated by comparing the average inequality change in countries with a Dual System to that in countries with a differentiated one (where the bar indicates averages across the groups of countries).

$$(1) \quad \gamma = (\bar{\mathrm{i}}_{\mathrm{treat,after}} - \bar{\mathrm{i}}_{\mathrm{treat,before}}) - (\bar{\mathrm{i}}_{\mathrm{control,after}} - \bar{\mathrm{i}}_{\mathrm{control,before}})$$

We implement the DID technique using equation 2, which pools together the skill inequality measures at age 15 and 27 in a regression framework.[7]

$$(2) \quad \mathit{Inequality\ index}_{pooled} = \beta_0 + \gamma_0 age27 + \beta_1 Y + \gamma_1 Y.age27 + residual$$

The parameter of interest is the change of the coefficient of the independent variable over the interval, which is captured by γ_1 in equation 2. $age27$ is an indicator set to 0 for the 15-year-olds observations and 1 for the 27-year-olds observations.

Data

This analysis is based on comparing the performance of students at different ages, using a pseudo-cohort derived from the 15-year-olds sample in PISA 2000 and the 25–29-year-olds sample in SAS (2011/12), who are roughly at the age that the PISA sample would have been 11/12 years later. SAS was conducted in 2011/12 in 25 countries and country regions under the supervision of the OECD, and tested adults aged 16–64 years for their competencies in literacy, numeracy and problem-solving skills (OECD, 2013). Sample sizes for the 25–29-year-old age group that we use varied between 327 and 1,715 across countries. In addition to skills test data, the survey also contains data on the highest qualification levels of respondents and their parents. Twenty one out of the 24 nations and regions that took part in SAS also participated in PISA 2000. This sub-group of countries constitutes our sample. Australia is not included in the analysis since its data are not publicly available.

SAS and PISA do not ask the same questions but they draw on similar underlying constructs of literacy and numeracy competence and both assess the ability to apply literacy and numeracy skills in real-world contexts (see Gal & Tout, 2014). They are both large surveys using nationally representative samples derived from standardised stratified sampling and both surveys use a battery of questions of different levels of complexity and compute scores based on the principles of item response theory in order to take into account both the number of correct answers and the difficulty of the items. SAS relies somewhat less than PISA on the explicit use of the terminology and procedures of formal mathematics, since adults are more removed from the learning of the latter, but both are testing the ability to solve similar real-world problems. On the basis of these similarities it should be possible to compare the results across the tests. Previous research has shown a very high correlation across countries between the results of a range of tests with significantly different designs, including the more curriculum-based TIMSS surveys and PISA tests with their focus on real-world application of knowledge and skills (Hanushek & Woßmann, 2006; Rindermann, 2007).[8] Indeed, several studies make use of a variety of international surveys of different age groups (such as PIRLS and TIMSS) to analyse cross-country variation in changes in skills levels and skills inequality between primary and secondary education (e.g. Annermuller, 2005; Hanushek & Woßmann, 2006).

However, there are some important differences between the assessment and reporting methods in SAS and PISA tests that need to be taken into account. PISA and SAS employ different response modes in their surveys and employ different scales. For these reasons the OECD (2013, p. 91) (see also Gal & Tout, 2014, p. 26) advocate caution in comparing absolute values in the two tests. The analysis here deals with these problems in two ways. The comparison of skills distributions across the two tests is not affected by the differential scaling issue. The chosen measure of inequality is the Gini coefficient, which is invariant to the unit of measurement and range of the test score as it depends on the rank of each individual in the whole distribution rather than on the specific test score. As the measure is divided by the average, it normalises for scale. Our measure for inequality of skills opportunity is a social gradient of skills. The comparison of this measure across the two surveys is potentially affected by the differential scaling issue. In this case we avoid interpretations of absolute changes in skills inequality, and limit ourselves to comparing relative changes across countries.

Indicators

Skills inequality. Skills inequality is measured in two ways. Our first measure is for the distribution of the literacy and numeracy skills with the breadth of the distributions measured by skills Gini coefficients. Our second is for inequality of skills opportunity, measured using social gradients of skills. Both PISA and SAS record the highest educational qualification of parents. The social gradient of skills is the ratio of the mean skills levels of young people whose parent(s) have no more than upper-secondary education and the mean skills levels of those who have a graduate parent. In both cases we are interested in the changes or relative changes in these measures between 15 year olds (assessed in PISA 2000) and 25–29 year olds (assessed in SAS 2011/12).

Rates of upper-secondary completion. We take completion of full upper-secondary education (and training) to be represented by graduation from long-cycle academic or vocational programmes lasting two or more years. Qualifications at this level correspond to ISCED levels 3 A, B and C (two years or more), where 3A is general education qualifications designed for direct access to higher education long-cycle general courses (ISCED 5A); 3B is vocationally oriented qualifications designed for direct access to ISCED 5B; and 3C (long) is vocational qualifications from programmes lasting two years or more, which are designed for direct access to the labour market or to ISCED level 4 vocational programmes (OECD, 1999). SAS collects data for the highest level of qualifications achieved by respondents, which are subsequently allocated to different ISCED levels by the participating country authorities. Since we are concerned with the qualifications achieved during the upper-secondary phase our indicator for full upper-secondary completion includes: all those whose highest qualification are at ISCED 4 and above (on the assumption that they all had to get ISCED 3 A, B or C (≥2) first), and those whose highest qualifications are at ISCED 3, A, B or C (≥2).[9] In addition to this we compute the social gradient of level 3 completers, using the SAS data on parents' educational levels.

Extent of Maths and national language provision. We use two variables for the extent of Maths and national language provision. *Mandatory maths and language learning* measures the degree to which the learning of Maths and the national language is compulsory on upper-secondary programmes. The data is obtained from a survey of 24 countries and country regions conducted by the Nuffield Foundation (Hodgen *et al.*, 2010), using country experts, with missing values supplemented by the authors' searches in the country specific reports and official documents. A value of 2 is given to a country where both subjects are compulsory on all programmes; 1 where one or the other is compulsory on all programmes and 0 where neither are compulsory on all programmes. The *Maths Prevalence variable* relates to the proportion of young people learning maths in upper-secondary education and training, with data likewise derived from the Nuffield Foundation study. The question posed in the survey is what proportion of young people that study *no* maths in upper-secondary education and training. Country values are based on a five-point scale where 5 = 0–5%; 4 = 6—20%; 3 = 2–50%; 2 = 51–80% and 1 = 81–94%.[10]

Parity of esteem between general and vocational tracks. We measure parity of esteem in two ways. The first indicator measures the prevalence of participation in vocational education and training on the assumption that where participation is higher it reflects the greater attractiveness of the track due to its relatively high quality. The *Vocational Prevalence* indicator is thus based on the ratio of those reporting highest qualifications at ISCED 4 or ISCED 3A, B or C (designated as vocational) to those reporting highest qualifications at ISCED 4 or above or ISCED 3 A, B (designated as non-vocational). The limitation of this measure is that students may be only opting for the vocational track because they cannot access the general tracks. The second indicator measures the social mix of the vocational track (proxied by the proportion of students gaining qualifications from this track who have graduate parents). For this purpose we also take the most inclusive definition of the vocational track, including all those whose highest qualification was ISCED 4 or ISCED 3 B, C (including less than two years). The assumption here is that where the proportion is greater this suggests smaller social gaps and therefore more parity with the general track.

Results

We start by looking at the changes in skills inequality measures between ages 15 and 27 across countries and country groups and at how countries rank in relation to the magnitude of these changes. Figures 1 and 2 shows the difference between the literacy and numeracy skills Gini coefficients in the SAS members aged 25–29 and PISA 2000 members aged 15. In literacy, all countries manage to reduce levels of inequality in the post-lower-secondary phase but the scale of the reduction varies significantly across countries. In numeracy, there are six countries where inequality increases during this phase, but in the remainder of countries it is mitigated, again to varying degrees.

The countries with Type 3 upper-secondary systems in our sample (Austria and Germany) show a relatively large reduction in inequality in both skills domains, albeit from relatively high levels, ranking in the top six countries in terms inequality mitigation in both literacy and numeracy. The countries with Type 4 'mixed systems' perform worst in terms of reducing levels of inequality across the two domains. England and Ireland rank in the bottom three in terms of inequality mitigation in both literacy and numeracy, showing substantial increases in the Gini for numeracy and only very small decreases in the Gini for literacy. Spain ranks last in inequality mitigation in literacy, with very little reduction in inequality and twelfth in inequality mitigation in numeracy. Only Northern Ireland, in this group, occupies a more middling position in the ranking.

Countries with Type 1, differentiated school-based upper-secondary systems, and Type 2, comprehensive school-based upper secondary systems, show more mixed results in terms of mitigating skills inequalities. Amongst the Type 1 countries, there

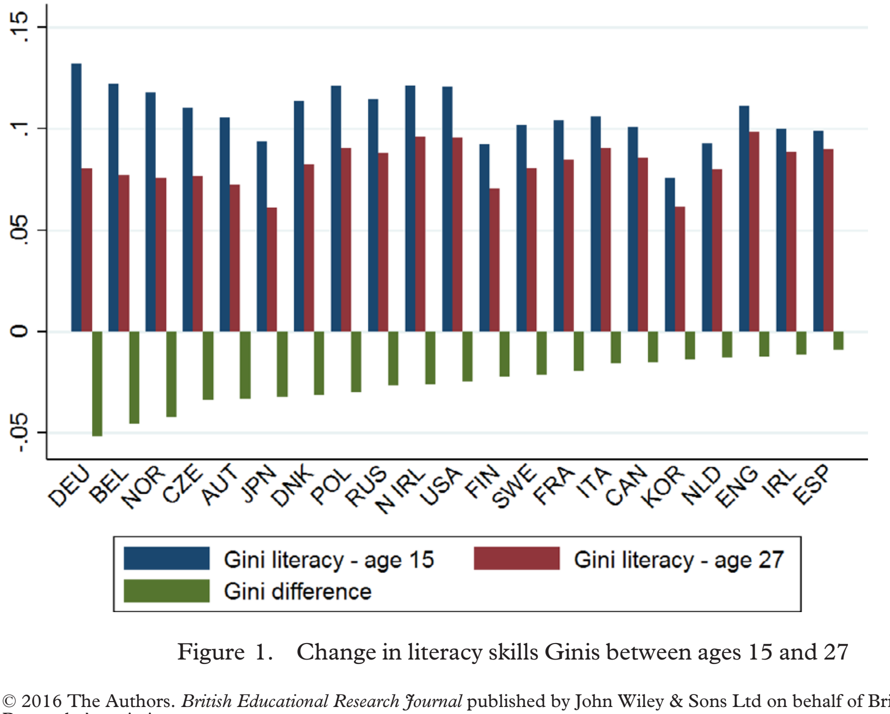

Figure 1. Change in literacy skills Ginis between ages 15 and 27

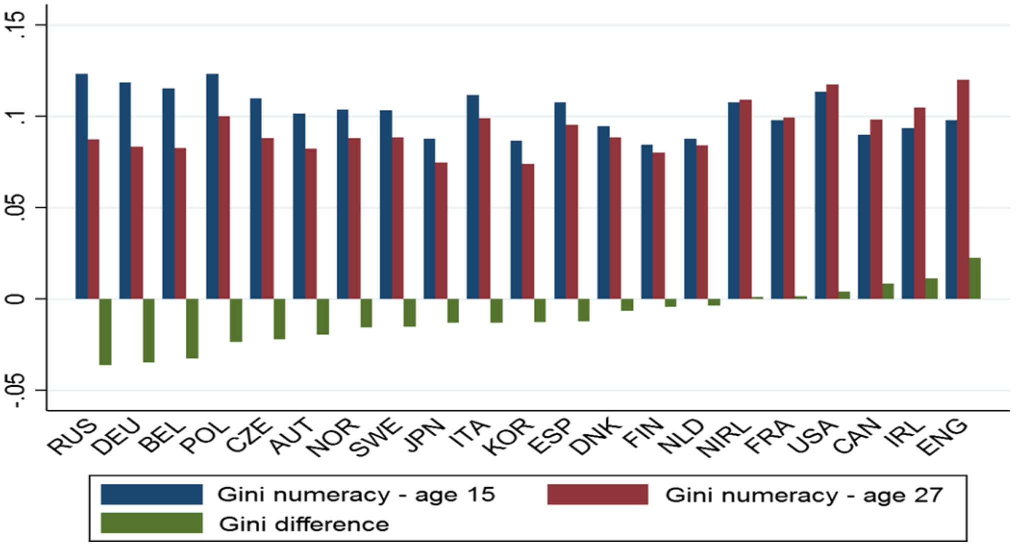

Figure 2. Change in numeracy skills Ginis between ages 15 and 27

are five countries (Russia, Poland, Japan and the Czech Republic) that rank in the top half in terms of inequality mitigation in both literacy and numeracy, and one, Denmark, which falls only just outside this. Russia achieves the largest reduction in numeracy inequality of all countries and a substantial reduction in literacy inequality. The Czech Republic, Poland and Japan also show substantial reductions in inequality in both skills domains. Denmark shows relatively large reductions in literacy inequality, but lies in a middling position in terms of numeracy inequality mitigation. In the other five countries with this type of system (Netherlands, Korea, Italy, France and Finland) mitigation of inequality is modest, with France actually showing an increase in inequality in numeracy. The Type 2 comprehensive school-based systems also present a quite mixed picture. Norway and Sweden are most successful in mitigating inequality, ranking in the top half in terms of inequality mitigation in numeracy and Norway third in inequality mitigation in literacy. Canada and the USA, however, perform much less well in terms of inequality mitigation. Numeracy inequality increases in both countries, more than in all but two other countries; literacy inequality declines only marginally in Canada, and at an average rate in the USA.

Figures 3 and 4 show the difference in the social gradients of literacy and numeracy skills between PISA 2000 members aged 15 and SAS members aged 25–29. There are considerable overlaps in the confidence intervals for each country but we can at least identify significant differences for literacy between the top six or seven and the bottom six in the rankings; for numeracy three groups of countries can be roughly distinguished: the top seven countries, the bottom five and the five countries in the middle of the rank ordering (from Sweden to Canada).

The countries with Type 3 systems show more mixed outcomes in relative mitigation of inequality of opportunity than with mitigation of skills outcomes. Nevertheless, Austria and Germany both rank among the seven top countries in mitigation of inequality of opportunity in both domains. The countries with Type 4 systems

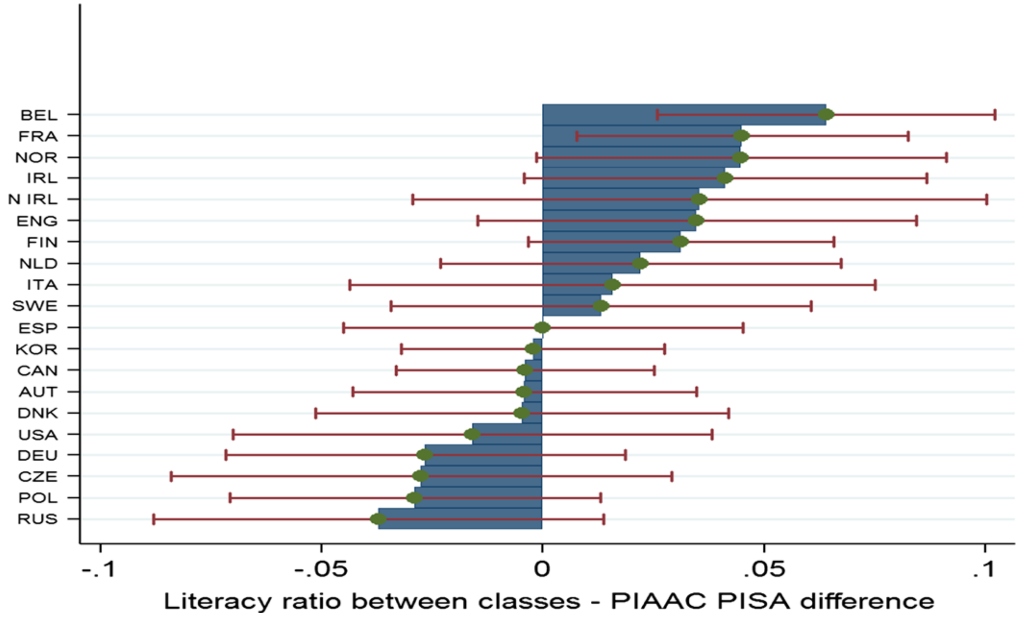

Figure 3. Changes in inequality of opportunity: Literacy (95% CI)

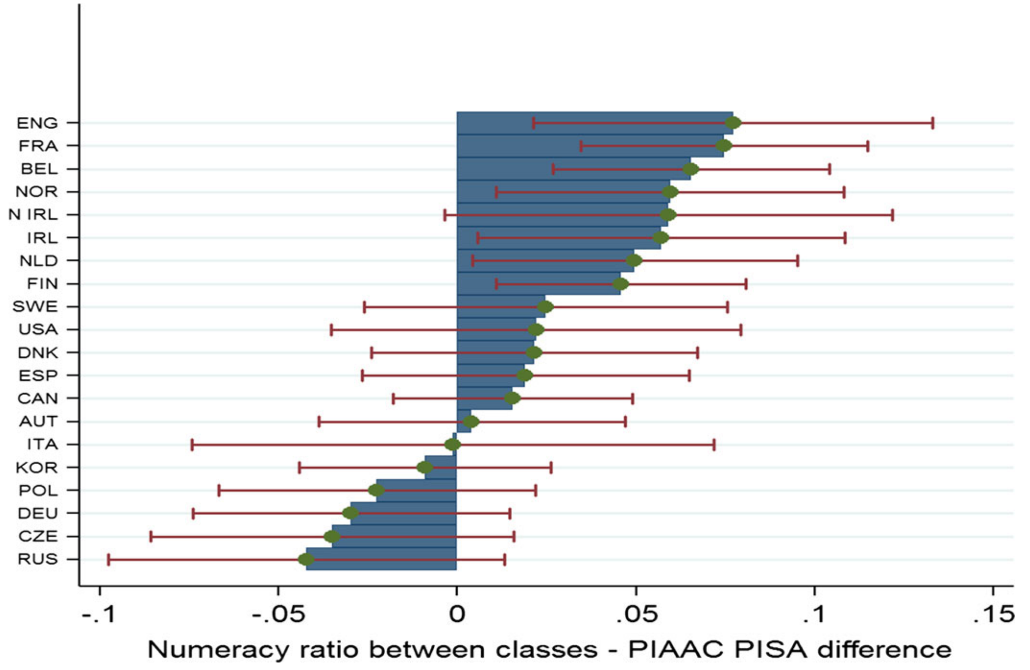

Figure 4. Changes in inequality of opportunity: Numeracy (95% CI)

perform worst relative to others in terms of mitigating inequality of skills opportunities across the two domains. England, Ireland and Northern Ireland mitigate inequality of skills opportunities less than most other countries across the two domains, while

Spain ranks in the middle of the ordering. This result mirrors the situation regarding mitigation of inequality in skills outcomes.

Countries with Type 1 and Type 2 systems also show mixed results in terms of relative mitigation of inequalities of skills opportunities. Among Type 1 countries, the East Asian (Korea) and CEE countries (Poland, Czech Republic, Russian Federation) exhibit substantial relative improvements in inequality of skills opportunity, as in inequality of skills outcomes. Type 1 western countries are not equally successful in mitigating inequality. France is second to last in the ranking for mitigation of inequality in both domains; Netherlands and Finland are in the upper-middle part of the ranking of most unequal countries. The Type 2 systems also do not show a common pattern. Norway mitigates inequality in both domains less than most other countries whilst Sweden and Canada have an average rank position. The USA has a middling position too in numeracy, but it mitigates literacy inequality more than most other countries.

Differences-in-Differences Analysis

Table 1 and Table 2 show the DID estimates for the relationships between education system types and characteristics and changes in inequality of skills outcomes and skills opportunities respectively. The nine models present the unconditional effect estimates of each explanatory factor separately. As we predicted in the original hypotheses, HE participation rates (Model 9) have no significant effect on changes in inequalities of skills opportunities or outcomes in either literacy or numeracy. The effects of youth unemployment rates (Model 8) are also not significant, except in respect of numeracy outcomes, but here higher unemployment rates are unexpectedly associated with reductions in skills inequality. Given the overall lack of significance in the effects of these factors pertaining to the life course after upper-secondary education and training we focus our analysis on the latter phase. Model 1 presents the effects of the system types on changes in skills inequality with the DID estimates using the Type 1 system as the reference case.

The DID regressions show that, compared with the Type 1 systems, Type 2 systems do not have a consistently different effect on skills inequality. Type 2a systems show for both domains a non-significant negative effect on inequality of skills outcomes but a significant positive ($p < 0.2$) effect on inequality of skills opportunities. Type 2b systems show a positive effect on inequality of outcomes (which is only significant for numeracy – at the $p < 0.01$ level) and no significant effects on inequalities of skills opportunities.

However, Type 3 and Type 4 systems do differ significantly from the reference case. Type 3 systems have significant negative effects, relative to the reference case, on inequality of outcomes in literacy ($p < 0.05$) and numeracy ($p < 0.2$). They also have negative effects on inequalities of opportunity for numeracy and literacy skills, but only at the $p < 0.3$ level. On the other hand, Type 4 systems have significant positive effects on inequality of outcomes in both literacy ($p < 0.1$) and numeracy ($p < 0.05$) and on inequality of skills opportunities in both literacy (at the $p < 0.2$ level) and numeracy (at the $p < 0.05$ level).

Table 1. The effects of system characteristics on inequality of numeracy and literacy outcomes

		Literacy	Numeracy
		DID estimate ($\gamma_1 Y.age27$)	DID estimate ($\gamma_1 Y.age27$)
Model 1 (N: 21)	Education system (Ref.: Differentiated)		
England, Ireland, N. Ireland, Spain	Mixed	0.0103847 *** (0.0050311)	0.0200053 **** (0.0081531)
Germany, Austria	Dual	−0.0173784**** (0.0082183)	−0.0128706** (0.0075919)
Sweden, Norway	Comprehensive (Nordic)	−0.0066884 (0.0062861)	−0.0008654 (0.004107)
US, Canada	Comprehensive (North America)	0.0049557 (0.005184)	0.0206856 ***** (0.0044668)
Model 2 (N: 18)	Vocational prevalence	−0.0385963 *** (0.0185493)	−0.0122034 (0.0314484)
Model 3 (N: 20)	ISCED 3 completion	−0.0486412 **** (0.0215021)	−0.0722444 *** (0.0382777)
Model 4 (N: 17)	Social mix vocational track	−.0003294 * (0.0002874)	−0.0002594 (0.0002596)
Model 5 (N: 19)	ISCED 3 social gradient	0.0024947 ** (0.0017545)	0.003043 *** (0.0014741)
Model 6 (N: 20)	Maths and language (0: ref cat)		
	1	−0.0050595 (0.0088002)	−0.0234435 **** (0.0089809)
	2	−0.0124188 **** (0.0052845)	−0.0262719 ***** (0.0062045)
Model 7 (N: 21)	No Maths	−0.0025277 ** (0.0016167)	−0.0047466 **** (0.0021075)
Model 8 (N: 21)	Youth unemployment (15–24, 2004)	−0.009342 (0.025895)	−0.0553222 ***** (0.0267629)
Model 9 (N: 20)	HE enrolment rate	0.0097084 (0.0192125)	0.0109703 (0.0206711)

***** $p < 0.01$, **** $p < 0.05$, *** $p < 0.1$, ** $p < 0.2$, * $p < 0.3$

Table 2. Effects of system characteristics on inequality of opportunities in literacy and numeracy

		Literacy	Numeracy
		DID estimate ($\gamma_1 Y.age27$)	DID ($\gamma_1 Y.age27$)
Model 1 (N: 21)	Education system (Ref.: Differentiated)		
England, Ireland, N. Ireland, Spain	Mixed	0.0257956 ** (0.0153532)	0.0414056 **** (0.018667)
Germany, Austria	Dual	−0.0174881 * (0.0151912)	−0.0246045 * (0.0197374)
Sweden, Norway	Comprehensive (Nordic)	0.0269098 ** (0.0177136)	0.0303923 ** (0.0200365)
US, Canada	Comprehensive (North America)	−0.0120852 (0.0130983)	0.0070817 (0.0144121)
Model 2 (N: 17)	Vocational prevalence	0.0478344 (0.0561742)	0.0408097 (0.0778425)
Model 3 (N: 19)	ISCED 3 completion	−0.1168168 ** (0.0495715)	−0.1763447 *** (0.0894423)
Model 4 (N: 16)	Social mix vocational track	0.0002567 (0.0007144)	0.0001697 (0.0009159)
Model 5 (N: 18)	ISCED 3 social gradient	0.003513 * (0.0031732)	0.0056699 ** (0.0040376)
Model 6 (N: 20)	Maths and Language (0: ref. category)		
	1	−0.0043835 (0.01339)	−0.0122578 (0.0129844)
	2	−0.0406949 ***** (0.0088289)	−0.0600176 ***** (0.011541)
Model 7 (N: 21)	No Maths	−0.0087195 **** (0.0036245)	−0.0141271 ***** (0.0042384)
Model 8 (N: 21)	Youth unemployment (15–24, 2004)	−0.048641 (0.0982997)	−0.0928815 (0.0993261)
Model 9 (N: 20)	HE enrolment rate	0.0031892 (0.0520461)	0.0192176 (0.0590414)

***** $p < 0.01$, **** $p < 0.05$, *** $p < 0.1$, ** $p < 0.2$, * $p < 0.3$

In general the results confirm that by comparison with the most common Type 1 systems, Type 4 mixed systems perform worst and the Type 3 Dual System performs best in terms of inequality mitigation. The Type 2 comprehensive systems, on other hand, do not perform very differently from the differentiated Type 1 systems. Figure 5 and Figure 6 illustrate the changes in inequality of outcomes in literacy and numeracy for the different system types.

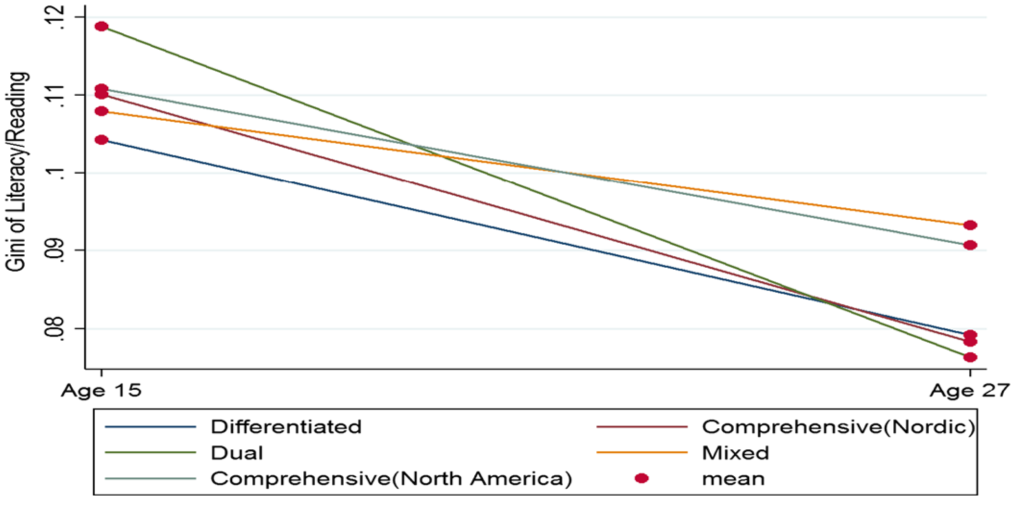

Figure 5. Change in skills inequality by education system – literacy

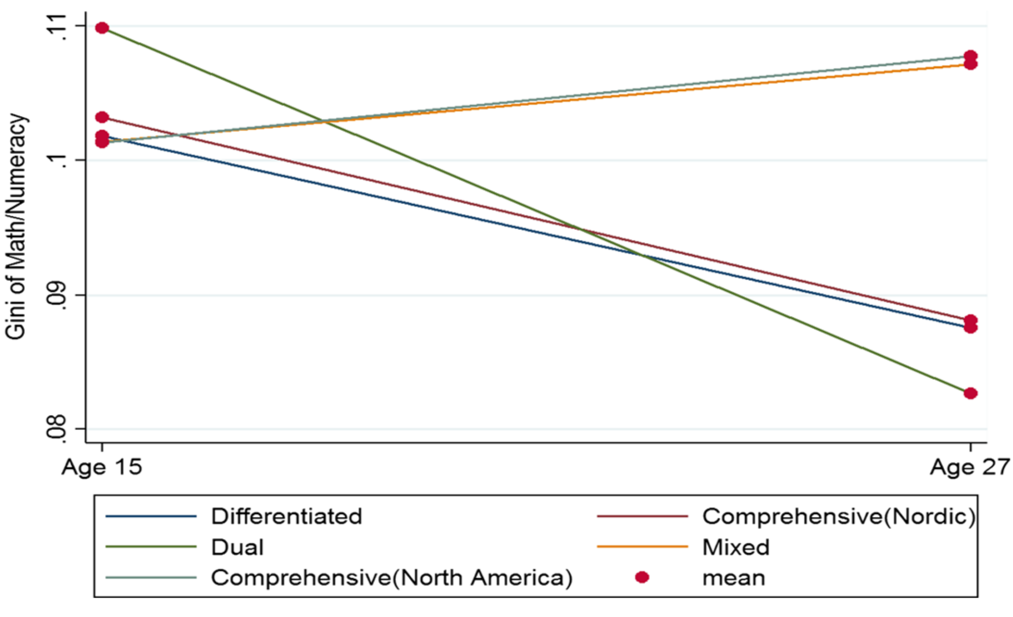

Figure 6. Change in skills inequality by education system – numeracy

Which factors are driving these differences in inequality mitigation across the different systems?

In the following section we look at the effects of each of the system characteristics that our hypotheses suggest may be associated with inequality mitigation. We use bivariate scatterplots, in which the change in the inequality measure is expressed as a function of each explanatory factor, in order to visualise the inequality change for each country. As the DID regressions in Tables 1 and 2 show, we find significant relationships between seven variables and changes in inequality of outcomes in either literacy or numeracy, but only four of these with both skills domains. Four variables are significantly associated with changes in skills opportunities for both literacy and numeracy. The indicators for parity of esteem generally have weaker effects than the indicators for standardisation of curricula. We start with the latter.

Effects of standardisation of curricula

The strongest effects we find on the mitigation of skills inequalities come from variables for the prevalence of Maths and national language learning and completion rates for full upper secondary education. The indicator for mandatory provision of both Maths and national language learning has a highly significant negative effect on inequality of skills outcomes in both literacy ($p < 0.05$) and numeracy ($p < 0.01$). It also has a highly significant negative effect on inequalities of skills opportunities for both literacy ($p < 0.01$) and numeracy ($p < 0.01$). The related indicator for the prevalence of Maths learning (see Figure 7) also has highly significant negative effects on inequality of skills outcomes in literacy ($p < 0.2$) and numeracy ($p < 0.05$) and on inequalities of skills opportunities in literacy ($p < 0.05$) and numeracy ($p < 0.01$). The indicator for completion of full upper-secondary education has significant negative effects on inequalities in skills outcomes both in literacy ($p < 0.05$) (see Figure 8)

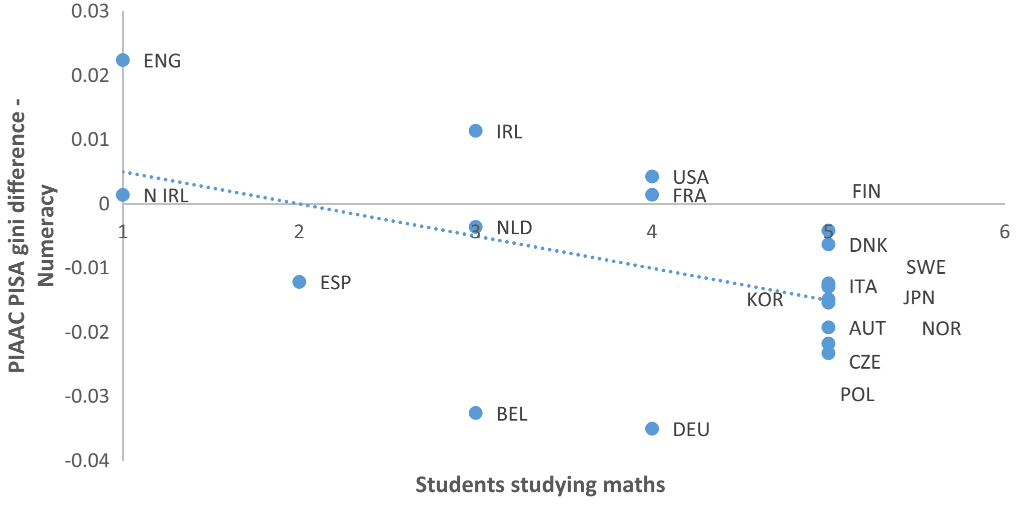

Figure 7. Prevalence of Maths study and mitigation of inequality in numeracy

and numeracy ($p < 0.1$) and on inequalities of skills opportunities both in literacy ($p < 0.2$) and numeracy ($p < 0.1$). We also find that the social gradients for level 3 completion are related across countries to changes in the Ginis for literacy and numeracy skills. Countries with steeper social gradients for level 3 completion tend to exhibit less mitigation of inequality in skills outcomes in both literacy ($p < 0.2$) and numeracy ($p < 0.1$).

These results strongly confirm our initial hypothesis that standardisation of access to the learning of Maths and the national language would be likely to reduce inequality in skills outcomes and opportunities. Where the study of both subjects is mandatory on all upper-secondary programmes and where the proportion of students studying no Maths is lower, systems are more effective at mitigating literacy and numeracy skills inequality. By the same token, where the duration of study of these subjects is equalised, mitigation of skills inequality is greater. Systems that have more universal access to long-cycle upper-secondary programmes are better at mitigating skills inequality than the systems with programmes of divergent lengths and where many students take only short programmes. Smaller social gaps in access to long-cycle programmes also seem to be conducive to mitigation of inequalities of skills outcomes and opportunities that suggests that social background effects are strong drivers of inequalities of skills outcomes.

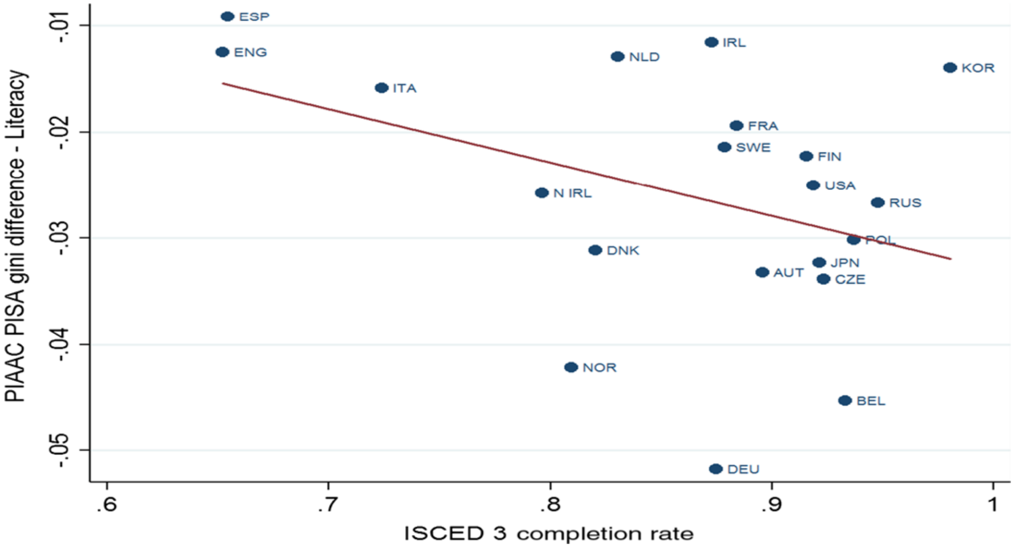

Figure 8. ISCED 3 completion and mitigation of inequality in literacy skills

Effects of parity of esteem

Our second hypothesis was that greater parity of esteem between the vocational and academic tracks would be likely to mitigate inequalities of skills. The analysis of the effects of the different indicators for parity of esteem only partially confirms our hypothesis.

Vocational prevalence is positively associated with inequality mitigation of literacy skills outcomes ($p < 0.1$, Model 2, Table 1), as Figure 9 illustrates. Countries where the proportion of students in vocational upper-secondary programmes is higher tend to see greater mitigation in inequality of literacy skills outcomes, as, for instance, in Austria, Germany and Norway. The social mix of vocational programmes is also positively associated with mitigation of inequality of skills outcomes in literacy. Countries where vocational tracks are more likely to include children of graduate parents, such as Germany, Japan and the Scandinavian countries (except Sweden), do tend to show greater inequality mitigation in literacy skills whereas Anglophone countries, with less social mixing, tend to mitigate inequalities less. However, neither of these variables has significant effects on mitigating inequality of numeracy skills outcomes or inequality of opportunities for skills.

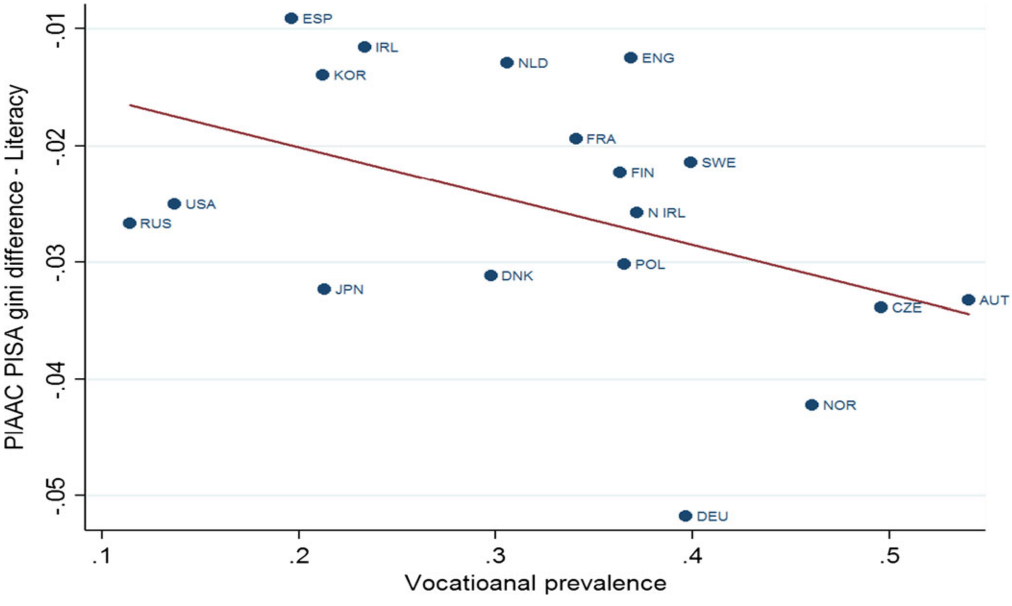

Figure 9. Vocational prevalence and changes in inequality of literacy skills

Conclusions

Our analysis shows that there is considerable variation across countries in what happens to inequalities in literacy and numeracy skills opportunities and outcomes between the ages of 15 and 27. Some countries are much better at mitigating skills inequalities than others during this phase of education and training. Type 3 systems in Austria and Germany, which combine relative parity of esteem between academic and vocational tracks with a degree of standardisation in programme duration and core skills curricula, are relatively good at mitigating skills inequality. Countries with school-based upper-secondary systems can also be relatively good at skills inequality mitigation when they combine extensive vocational provision with mandatory core skills learning and high rates of full level 3 completion. This includes some countries with Type 1 differentiated systems (Czech Republic, Poland and Russia) and some countries with Type 2 integrated systems (Norway and Sweden). However countries with Type 4 mixed systems, including England, Ireland, Northern Ireland and Spain in our sample, are almost uniformly poor at mitigating skills inequality. Our analysis here suggests that this may be partly because they tend to have low participation in high-quality vocational programmes. But the primary reason would seem to lie in the very unequal access they provide to core skills learning: the leaning of Maths and the national language is not mandated; programme durations are very diverse; and rates of completion of full upper-secondary education are relatively low.

In line with Boudonian theory, we find that standardisation of provision can reduce inequality of skills outcomes. But here this applies only in respect of the duration of studies, and their inclusion of substantive elements of Maths and language learning. Segmentation – or 'tracking' – in respect of other subjects and aspects of pedagogy may not matter so much during this phase. Boudon's theory was designed to explain the reproduction of social inequalities in educational attainments during schooling. We should not be surprised to find that the theory needs to be revised somewhat to provide a comparative explanation of the effects of upper-secondary education and training on literacy and numeracy skills inequalities. In the first place, as we have argued, 'tracking' can have different effects on inequalities in upper-secondary education than in earlier phases of education. Whereas different tracks in the earlier phases are almost always arranged in a monotonic hierarchy based on academic prestige, in upper-secondary education, which is more proximate to the labour market, different principles of differentiation may apply, particularly where there are vocational routes that derive their prestige from their success in getting participants into skilled jobs, rather than into higher education. Secondly, in this case we are dealing with the circumscribed set of skills in numeracy and literacy, and not with educational attainments *tout court*. In this case, the explanation of the variation across countries in mitigation of inequalities in the upper-secondary phase may be relatively prosaic. That is to say that to reduce disparities in basic skills the most important thing is to ensure that access to learning of these particular skills is relatively standardised across the different tracks, however these may be organised institutionally.

For countries where mitigation of skills inequality at the upper-secondary level is weak, the most appropriate policy response might be to standardise the length of upper-secondary programmes and make the learning and examination of Maths and the national language mandatory.

Acknowledgement

This article is based on research in the LLAKES research centre funded by the ESRC: grant reference ES/J019135/1.

NOTES

[1] This paper has only been concerned with social class inequalities in skills, but other research has shown that these mechanisms can also apply in terms of inequalities associated with gender and ethnicity.

[2] For students who repeat years study can last up to five years in some countries.

[3] Denmark could be considered a borderline case because up to 30% of young people take a form of apprenticeship, but many of the apprentices are not on traditional apprentice contracts as in Dual System apprenticeships.

[4] This is defined by the European Commission as those who leave education without qualifications above the ISCED 3C (short) level.

[5] In fact, our initial correlation across countries of HE participation rates and skills inequality mitigation shows a curvilinear relationship, described by an inverted U curve. When participation rates in tertiary education are relatively low (below 40%), as in Austria, Belgium, Germany and the Czech Republic, they are associated with countries with relatively large reductions in literacy skills inequality, but as the rates rise to 50% inequality mitigation is declining. However, above the 50% threshold, increasing participation rates are associated with greater mitigation of skills inequality. The overall effects however, seem to be quite small, and they are not significant in the DID regressions we show later. The data for first-time entrants to tertiary education as a percentage of the population of the corresponding age group are taken from OECD Education: Key Tables. Available online at: http://www.oecd-ilibrary.org/content/table/20755120-table2 (accessed 5 January 2016).

[6] Our DID analysis of the effects of youth unemployment on changes in skills inequality shows no significant relationships except in the case of numeracy skills outcomes, and here the effect is, unexpectedly, positive. Data on unemployment rates for 15–24s in 2005 are taken from OECD Labour Market Statistics at: http://stats.oecd.org/index.aspx?queryid=36324#

[7] For instance, the correlation coefficients between the TIMSS 2003 tests of 8th graders and the PISA 2003 tests of 15-year-olds across the 19 countries participating in both are 0.87 in Maths/numeracy and 0.97 in science (Hanushek & Woßmann, 2010).

[8] There is also a high correlation at the country level between the curriculum-based student tests of TIMSS and the practical literacy adult examinations of IALS (Hanushek & Zhang, 2009).

[9] In the case of England, we exclude those whose highest qualification has been classified as ISCED 3C (≥2), since this category includes many qualifications, like GCSEs, GNVQ Intermediate, BTEC First, NVQ 2 and City and Guilds Level 2, which can either be taken during lower-secondary education, or require less than two years of full upper-secondary education. For other countries in the survey, qualifications classified to ISEC 3 C (≥2) include only those for which the earliest age of completion is 17 or 18 years, whereas for England the minimum age at which the above qualification can be gained is noted (correctly) as 16 years.

[10] For Norway see: UNESCO The Development of Education 1991 to 2000 – National Report from Norway http://www.ibe.unesco.org/International/ICE/natrap/Norway.pdf. For Poland: UNESCO World Data on Education. http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/Poland.pdf

References

Ammermuller, A. (2005) *Educational opportunities and the role of institutions*. ZEW Discussion Paper 05–44 (Mannheim, Centre for European Economic Research).

Bol, T. & van de Werfhorst, H. (2013) Educational systems and the trade-off between labour market allocation and equality of educational opportunity, *Comparative Education Review*, 57(2), 285–308.

Boudon, R. (1974) *Education, opportunity, and social inequality: changing prospects in western society* (New York, John Wiley & Sons).

Brunello, G. & Checchi, D. (2007) Does school tracking affect equality of opportunity? New international evidence, *Economic Policy*, 22(52), 781–861.

Busemeyer, M. (2014) *Skills and inequality: partisan politics and the political economy of education reforms in western welfare states* (Cambridge, Cambridge University Press).

Busemeyer, M. & Iversen, T. (2011) Collective skills systems, wage bargaining and labour market stratification, in: M. Busemeyer & C. Trampusch (Eds) *The political economy of collective skill formation* (Oxford, Oxford University Press) 3–38.

Card, D. & Krueger, B. (1994) Minimum wages and employment: A case study of the fast-food industry in New Jersey and Pennsylvania, *The American Economic Review*, 84(4), 772–793.

Esping-Andersen, G. (1990) *The three worlds of welfare capitalism* (New Jersey, Princeton University Press).

Eurostats (2014) *Eurostat statistics explained*. Available online at: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/School_enrolment_and_early_leavers_from_education_and_training (accessed 27 October 2014).

Gal, I. & Tout, D. (2014) *Comparison of PIAAC and PISA frameworks for numeracy and literacy*. OECD Education Working paper 102 (Paris, OECD).

Green, A. (2000) Lifelong learning and the learning society: Different European models of organization, in: A. Hodgson (Ed) *Policies, politics and the future of lifelong learning* (London, Kogan Page), 35–50.

Green, A. (2003) The many faces of lifelong learning: Recent education policy trends in Europe, *Journal of Education Policy*, 17(6), 611–626.

Green, A. (2013) *Education and state formation: Europe, East Asia and the USA*. Revised and Extended Second Edition (Basingstoke, Palgrave).

Green, A. & Janmaat, J.-G. (2011) *Regimes of social cohesion: societies and the crisis of globalisation* (Basingstoke, Palgrave).

Green, A., Green, F. & Pensiero, N. (2015) Cross-country variation in adult skills inequality: Why are skill levels and opportunities so unequal in Anglophone countries?, *Comparative Education Review*, 59(4), 595–618.

Hall, P. & Soskice, D. (Eds) (2001) *Varieties of capitalism: The institutional foundations of comparative advantage*, (Oxford, Oxford University Press).

Hanushek, E. & Woßmann, L. (2006) Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries, *The Economic Journal*, 116(510), 63–76.

Hanushek, E. & Woßmann, L. (2010) *The economics of international differences in educational achievement*. NBER Working Paper 15949 (Cambridge, MA, National Bureau of Economic Research).

Hanushek, E. & Zhang, L. (2009) Quality-consistent estimates of international schooling and skill gradients, *Journal of Human Capital*, 3 (2), 107–143.

Heath, A. & Sullivan, A. (2011) Introduction: the democratisation of upper secondary education? *Oxford Review of Education*, 37 (2), 123–138.

Hodgen, J., Pepper, D., Sturman, L. & Ruddock, G. (2010) *Is the UK an outlier? An international comparison of upper secondary mathematics education* (London, Nuffield Foundation).

Hodgson, A. & Spours, K. (2014) 'Heavy fog in the Channel – continent cut off': Reform of upper-secondary education from the perspective of English exceptionalism, *European Educational Research Journal*, 13(6), 683–698.

Jackson, M. (Ed) (2013) *Determined to succeed? Performance versus choice in educational attainment* (Stanford, Stanford University Press).

Keep, E. & Mayhew, K. (2014) Inequality – 'wicked problems', labour market outcomes and the search for silver bullets, *Oxford Review of Education*, 40(6), 764–781.

Lasonen, J. & Young, M. (1998) *Strategies for achieving parity of esteem in European upper secondary education* (Jyväskylä, Institute for Educational Research, University of Jyväskylä).

Lucas, S. (2001) Effectively maintained inequality: Education transitions, track mobility, and social background effects, *American Journal of Sociology*, 106(6), 1642–1690.

OECD (1985) *Education and training beyond basic schooling* (Paris, OECD).

OECD (1999) *Classifying educational programmes: Manual for ISCED-97 implementation in OECD countries* (Paris, OECD).

OECD (2008) *Education at a glance* (Paris, OECD).

OECD (2010) *PISA 2009 results: Overcoming social background. Equity in learning opportunities and outcomes* (vol. 11) (Paris, OECD).

OECD (2013) *The survey of adult skills: Reader's companion* (Paris, OECD).

OECD (2014) *Education at a glance* (Paris, OECD).

Pontusson, J. (2008) *Social democracy, varieties of capitalism and globalization: sketch of paper*. Available online at: http://www.people.fas.harvard.edu/~ces/conferences/left/left_papers/SocDemo05-08.pdf (accessed 14 April 2015)

Raffe, D., Brannen, K., Fairgrieve, J. & 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.

Raffe, D., Howieson, C., Spours, K. & Young, M. (1998) The unification of post-compulsory education: Towards a conceptual framework, *British Journal of Educational Studies*, 46(2), 169–187.

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

Rindermann, H. (2007) The *g*-factor of international cognitive ability comparisons: the homogeneity of results in PISA, TIMSS, PIRLS and IQ tests across nations, *European. Journal of Personality*, 21, 667–706.

Schneider, S. L. & Tieben, N. (2011) A healthy sorting machine? Social inequality in the transition to upper secondary education in Germany, *Oxford Review of Education*, 37(2), 139–166.

Schütz, G., Ursprung, H. & Woßmann, L. (2008) Education policy and equality of opportunity, *Kyklos*, 61(2), 279–308.

Solga, H., Protsch, C., Ebner, C. & Brzinsky-Fay, C. (2014) *The German vocational education and training system: its institutional configuration, strengths and challenges*. Discussion Paper (Bonn, University of Cologne and Federal Institute for Vocational Education and Training).

Steedman, H. (2001) *Benchmarking apprenticeship: UK and continental Europe compared*. Report for London, Centre for Economic Performance (London, London School of Economics).

Steedman, H. (2010) *The state of the apprenticeship in 2010*. Report for London, Centre for Economic Performance (London, London School of Economics).