

Jovicic, Sonja

Conference Paper

Literacy skills, equality of educational opportunities and educational outcomes: an international comparison

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2017: Alternative Geld- und Finanzarchitekturen - Session: Income Distribution, Inequality and Poverty, No. F19-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Jovicic, Sonja (2017) : Literacy skills, equality of educational opportunities and educational outcomes: an international comparison, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2017: Alternative Geld- und Finanzarchitekturen - Session: Income Distribution, Inequality and Poverty, No. F19-V2, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/168117>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

**FIRST DRAFT
DO NOT CITE WITHOUT PERMISSION**

February 14th

Literacy skills, equality of educational opportunities and educational outcomes: an international comparison

Sonja Jovicic

University of Wuppertal, Germany

This paper assesses the role of literacy skills as an equalizer in both educational outcomes and educational opportunities. First, by linking two surveys of adult skills for 11 OECD countries (PIAAC - Survey of Adult Skills (conducted in mid-90s) and IALS - International Adult Literacy Survey (conducted in 2011)), the relationship between performance (average literacy test scores) across countries and within-country skill inequality (dispersion in literacy test scores) is examined. Although Okun's-style tradeoff could suggest that there is a tradeoff between efficiency and equity, in this analysis the opposite holds true; countries with higher average literacy test scores have, at the same time, higher equality in literacy test scores. Second, intergenerational educational mobility (equality of opportunity) across countries, and the effect of family background coefficients on both average literacy scores and equality in literacy scores is estimated. There is a significant effect of parental education levels on children's test scores in all countries, but there is a substantial cross-country variation in the size of the coefficients, which suggests that families play different roles in the transmission of educational skills across countries. Furthermore, this paper finds that increasing the average literacy scores (particularly by improving the literacy skills of the low-skilled) is positively associated with higher intergenerational educational mobility and higher equality of literacy test scores.

Although all countries experienced substantial educational expansion, this educational improvement did not lead to higher average literacy scores in most countries. Whereas higher education levels produce higher scores, population ageing negatively affects those scores. Third, by decomposing differences in the average literacy scores between the surveys, this paper finds that the literacy scores for each educational-age group declined, which might imply a decrease in educational efficiency in all countries (particularly in secondary and post-secondary schooling). From a policy perspective, increasing educational attainment alone is not enough; focus on educational reform and better quality of schooling is required in order to improve educational efficiency; as well as investing in skills throughout the life cycle. Additionally, family policies and active role of the welfare state might be necessary in order to tackle inequalities.

Keywords: Education, Skills, Inequality, Intergenerational Mobility, Public Policy

JEL Classification: I21, J62, J68, H52

1. Introduction

This paper assesses the role of literacy skills as an equalizer in both educational outcomes and educational opportunities. There is a substantial cross-country variation in the average skill levels and skill dispersion of the adult population. From a policy perspective, it is interesting to understand whether these cross-country differences in average skill levels are associated with cross-country differences in skill equality and intergenerational educational mobility, and this is the topic this paper is trying to explore. Better skills and higher education levels are very important policy goals, particularly because higher educational performance possibly lead to higher productivity (Woessmann 2004; Card 1999), earnings, social prosperity, employment, economic growth (OECD, 2010, 2012a, 2012b). These potential benefits are the reason why most economists agree that investing in human capital and increasing educational attainment should be important part of every political agenda. Whereas it is under debate whether equal outcomes are necessarily desirable, economists mainly agree on importance of having equal opportunities to succeed in life and fulfill his potential. Each person's success should depend on his talents, motivation, sacrifice of time and effort and should not depend on the socioeconomic status of his parents. This paper is trying to link these two strands of literature by answering the following question: is better performance (measured by average literacy test scores) across countries related to within-country skill inequality (dispersion in literacy test scores) and intergenerational educational mobility (measured by the estimated coefficient of parental education levels on their children's test scores)? Furthermore, this paper also explores what are the possible drivers of the cross-country differences in the average literacy scores and their changes. By making a comparison between different developed countries, there is an opportunity to understand the extent of the differences between countries, and reasons that might lay behind the differences and the changes. Hopefully, this kind of analysis might then shed light on what could be done in order to make improvements.

This empirical analysis builds on earlier work, and shares most similarities with Freeman *et al* (2011). Based on the PISA mathematics tests (waves 2000 and 2009), these authors look at the relation between inequality of student scores, averages level of scores, and family-background. Whereas they reject equity efficiency tradeoff, they find no relationship between the family background effects and dispersion of scores. Woessmann (2004) analyzes the effects of family background characteristics on student math scores across 18 countries using TIMSS tests conducted in 1995 (target population are 13-years-olds). He finds no relation

between equality of opportunity and countries' mean performance. Based on the PIAAC survey, Solga (2014) finds an association between mean literacy scores and economic inequality and stresses out the importance of investing in children's education, but also in more equal family conditions, and an active role of the welfare state in order to achieve higher economic equality. This paper shares the most similarities with Freeman *et al* (2011) and tries to replicate their analysis based on the literacy skills and adult working-age population to check whether the results that hold for 15-years-olds can be confirmed among the adult working-age population. Additionally, this analysis explores cross-country differences in the average literacy scores and their changes.

This paper is organized as follows. Section 2 describes the data set, data adjustments and reports descriptive statistics. The following section analyzes tradeoff between equality and efficiency. Section 4 explores the effects of family background and its relationship to average skill levels and skill equality. The subsequent section attempts to shed light on the cross-country differences in the literacy test scores and their changes. Finally, last section concludes.

2. Data Description and Statistics

This analysis is focused on adult skills measured by literacy test scores and their change between the two skill surveys: Survey of Adult Skills (PIAAC) and International Adult Literacy Survey (IALS). Both surveys were initiated by the OECD and collected in 2011-2012 (PIAAC) and 1994-1998 (IALS). These data sets comprise the survey data on various indicators of adult competencies, demographic, socio-economic, and other information internationally comparable across OECD countries. The number of countries that took part in the surveys is higher in PIAAC than in IALS; however this analysis is limited to 11 highly developed OECD countries that took part in both surveys: the United States, the United Kingdom, Ireland, Denmark, Finland, Norway, Sweden, Belgium, Germany, Italy, and the Netherlands¹. Countries' sample sizes are bigger in PIAAC (around 5,000 observations per country) than in IALS (2,000-3,000 observations). In both data sets national weighted² samples based on representative civilian non-institutional working-age population (16-65)

¹ Canada is excluded from the analysis, due to the missing information on age (both surveys) and education levels (IALS).

² Weighted to population in relevant time periods

were generated, which makes them both representative and comparable. Both surveys were conducted by an interview with similar background questionnaire and the competency test. Existing differences in the background questionnaire were accounted for by creating new derived variables that enabled better compatibility between two surveys. This analysis is based on the comparable, linking variables in both surveys, which are marked as “trend” variables in the two data sets.

In the PIAAC, adult skills are measured by literacy, numeracy, and problem-solving in technology-rich environments that are central for good performance in the labor market and successful participation in society. However, only literacy skills are comparable between the two surveys. Whereas definition of numeracy skills varies between surveys, problem solving domain was not tested at all in IALS. Numeracy tests in PIAAC are much broader and involve wider variation of tasks than quantitative literacy tests in IALS, which mainly consist of computational tasks only. Since tasks vary considerably, these two competency domains are not comparable. Although literacy test scores in their original shape were not directly comparable between the two surveys either, OECD conducted technical adjustments and rescaled literacy scores in IALS, so that they match literacy scores in PIAAC³. In IALS, prose literacy and document literacy were tested separately, consequently OECD needed to rescale them in order to combine them into one literacy test score scale. These two parts were also included as a part of literacy domain in PIAAC, which makes them directly comparable between two surveys. Additionally, literacy skills in PIAAC are broader, and they involve reading component part as well. However, 18/24 items were linking items in the paper-based assessments, and 29/52 in the computer-based version (see OECD, 2013 for comparison of the surveys)⁴. This is another important difference between the surveys: whereas IALS tests were paper-based, in PIAAC adults had an opportunity to choose between paper and computer-based tests. According to the OECD, this did not affect adults’ scores.⁵ These literacy test score results from both surveys were then divided into six literacy skill levels. Skill levels are defined according to literacy score results in the following way: L0<176; L1=176-226; L2=226-276; L3=276-326; L4=326-376; L5>376 points. For the purpose of this analysis, lowest levels 0 and 1, and highest levels 4 and 5 are merged together, due to the

³ For more information on the procedure, see Technical Report of the Survey of Adult Skills (2013)

⁴ In these kinds of surveys there will always be a tradeoff between administering the same items (which maximizes comparability over time) and adding new items (skills/tasks that are more relevant at the time the survey is taken).

⁵ For that purpose, OECD conducted a field test in 2010 that confirms no significant difference in scores regarding 2 different delivery modes (see OECD, 2013).

small samples. The definition of the PIAAC literacy test is as follows, “understanding, evaluating, using, and engaging with written text to participate in society, to achieve one’s goals, and to develop one’s knowledge and potential.” (OECD, 2013:59). In order to determine relationship between adult competencies and parental education, data on highest obtained education levels is necessary. Adults’ (and their parents’) education levels were measured according to the standardized ISCED levels (0-9) that are comparable across countries. Based on this classification, three different levels were created: low (upper secondary schooling), middle (secondary and post-secondary, non-tertiary education), and high (tertiary education or higher). Furthermore, this analysis is restricted to the age group 25-65, since the youngest adults (16-24) could still be involved in schooling.

Analysis in this paper is focused primarily on literacy test scores as the measure of skills, since literacy test scores have many important advantages over other measures. It is challenging to obtain the right measure of human capital and skills; and there have been different ways of assessing the level of human capital in the literature. The most traditional ones are years of schooling and levels of education. The correlation coefficient between years of schooling and literacy test scores in this sample is positive, but rather lower than expected (0.54 in IALS, and 0.50 in PIAAC). By using years of schooling as a measure of skill it is required to assume that one year of schooling produces the same level of skills in all countries, which is fairly unrealistic. Previous research showed that there is a high dispersion of adult skills within the same education level/years of schooling; educational degree doesn’t produce a precise skill level either (see Jovicic, 2015; Devroye and Freeman, 2001). Additionally, skills change over the life-cycle, but these changes aren’t captured by the educational degree either, which ones earned remain throughout the whole life. Furthermore, adult literacy surveys show better international comparability, since identical tests were taken in every country, whereas years of schooling and education levels don’t produce the same skills across countries. Tyler *et al* (2000) offer further evidence in favor of using cognitive scores as a superior measure of skill by showing that even among those with the fewest educational attainment (high school dropouts) there are substantial earning returns to basic cognitive skills as measured by GED test scores.

Table 1 reports mean, median and standard deviation of literacy test scores in IALS, PIAAC, and their change. In IALS, countries with the highest average literacy scores were Scandinavian countries (Norway, Sweden, Denmark and Finland), whereas countries with the

lowest average literacy scores were Italy, Ireland, UK, and the US. Around 15⁶ years later ranking of the countries did not change considerably; yet within-country changes were noteworthy. Countries that experienced the highest decline in the average scores were Denmark, Norway, Sweden and Germany. As mentioned above these were the countries with the highest average literacy scores in IALS; despite this dramatic decrease, Sweden and Norway remain the leaders with the highest average literacy scores. Only Finland and the Netherlands remain countries with relatively high average literacy scores, mainly by keeping stable average scores comparatively to IALS (average literacy scores did not change much). On the other hand, some countries experienced improvements in their average literacy scores: Italy, UK, and Ireland. As shown previously, Italy and Ireland had the lowest level to start with; this positive change still leaves them on the last places in the new survey. They are followed by Germany and the US. To conclude, Scandinavian countries (Finland, Norway and Sweden) are the countries with the highest literacy scores despite suffering major losses in the number of average test points between two surveys. Ireland and Italy show the opposite story: they had lowest results in the both surveys, despite achieving significant improvements in the average scores. The UK and the US were not doing particularly well in any of the surveys. The average scores in the pooled sample, however, remained constant between the two surveys.

Table 1: Summary statistics of literacy scores, IALS, PIAAC and their change (25-65)

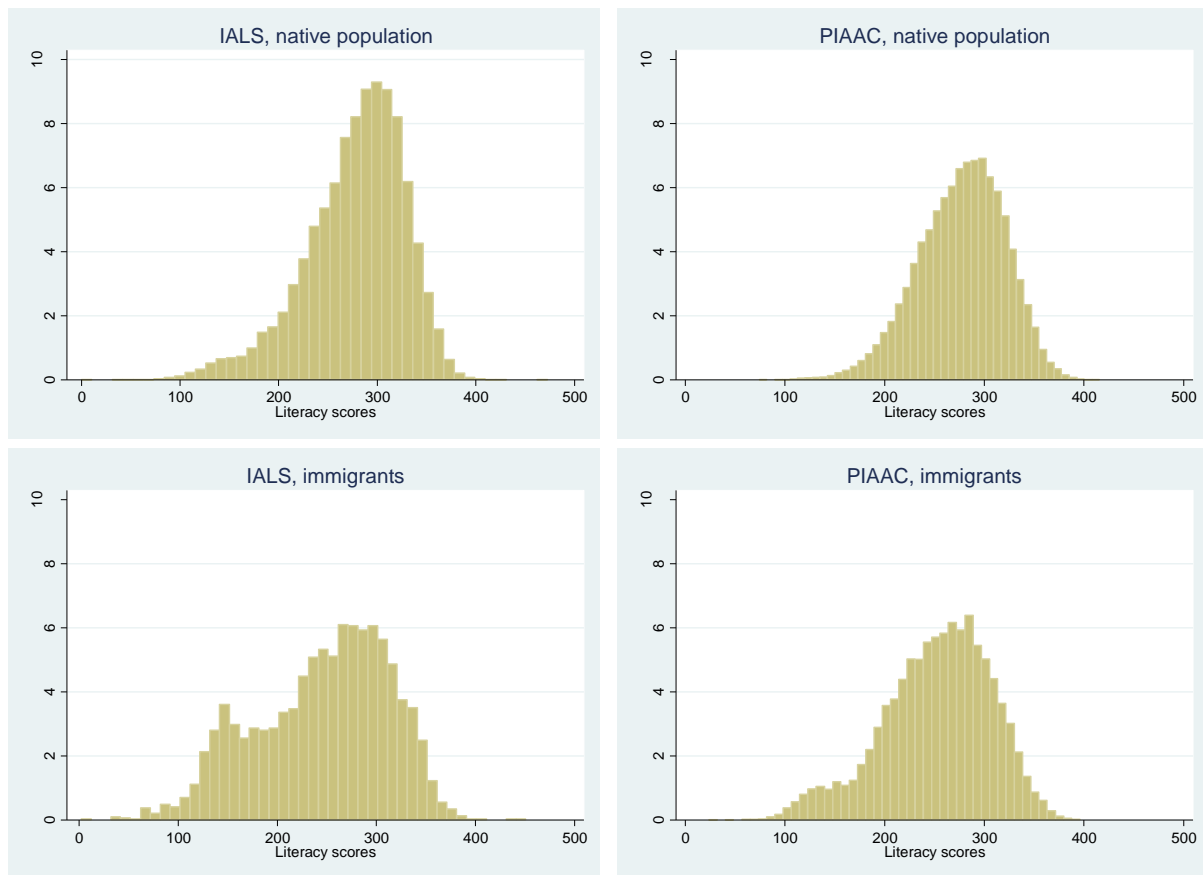
Survey	IALS (1996)			PIAAC (2011)			Change
Country	Mean	Median	St.Dev.	Mean	Median	St.Dev.	Median
BEL	272.12	280.00	52.02	273.73	278.49	47.82	-1.51
DEN	286.81	290.75	41.81	269.69	275.28	48.80	-15.47
FIN	282.25	287.67	48.47	285.67	289.93	51.87	2.26
GER	280.52	281.75	43.97	268.08	271.10	47.73	-10.65
IRE	259.91	265.89	57.01	265.69	269.91	48.35	4.02
ITA	236.46	243.77	57.88	248.74	250.63	44.67	6.86
NED	277.44	283.54	47.63	281.83	287.23	49.44	3.69
NOR	291.70	297.65	45.63	279.19	284.59	47.76	-13.06
SWE	290.12	295.85	55.03	278.43	284.06	51.56	-11.79
UK	264.54	272.18	60.92	273.92	277.11	49.34	4.93
US	274.77	283.27	59.71	269.42	273.40	50.51	-9.87
Pooled	277.77	285.25	50.59	277.27	280.65	43.62	-4.6

Source: Calculations based on IALS and PIAAC

⁶ 13-17 years, since depending on the country IALS was taken between 1994 and 1998

One important factor that could affect results in the further analysis, and has potential to explain part of these cross-country differences in the average literacy scores and their changes are cross-country differences in the shares of immigrants. Figure 1 shows distribution of literacy scores in IALS and PIAAC, for native population and immigrants (age 25-65). Figure 1 shows clearly that literacy scores of immigrants are concentrated more in the low skill levels in both surveys, which is in line with previous studies based on IALS (Devroye and Freeman, 2001; Freeman and Schettkat, 2001). The major reason for low performance of immigrants is the fact that literacy tests are done in country's national languages, where immigrants often encounter language barriers, and consequently acquire fewer points. This problem is even more pronounced in this analysis which is based on the literacy tests which assess reading and understanding of texts, as opposed to numeracy tests which were used in above-mentioned and other studies (in which language barriers might be slightly less important). As a result, cross-country variation in the proportion of immigrants and a change in their proportion have potential to explain cross-country differences in scores and their changes. Norway, Sweden, and Denmark are the countries where the overall average literacy test scores decreased the most; at the same time they had the highest increase in the share of immigrants. On the other hand, the biggest immigration countries (Anglo-Saxon countries) are also the countries where the overall average literacy scores are the lowest. It is likely that depending on the country, these low literacy scores and decrease in literacy scores can be partly explained by the lower average literacy scores of immigrants and their high (increasing) shares in the adult population. To sum up, immigrants acquired schooling elsewhere, their scores tend to be underestimated (due to language difficulties), reasons for choosing a specific immigration country are idiosyncratic, and there are big cross-country differences in the shares of immigrants. These are the reasons why in the analysis in this paper, the focus is on native population only (immigrants are excluded).

Figure 1: Distribution of literacy skills in IALS and PIAAC, native population and immigrants (age 25-65)



Source: Calculations based on IALS and PIAAC

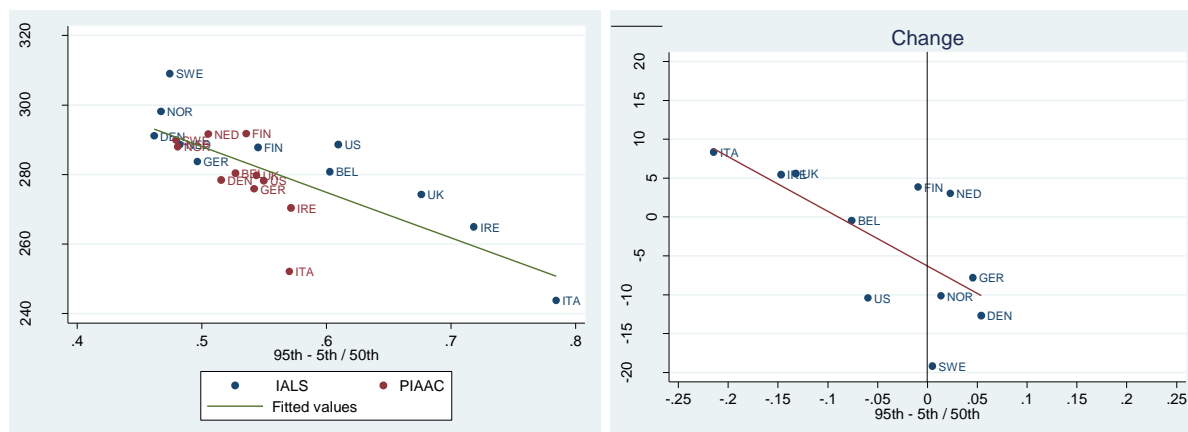
3. A tradeoff between educational efficiency and equality

High economic inequality has been tolerated by many economists by claiming that high economic inequality fosters high economic efficiency. In most economic situations it is not possible to achieve both efficiency and equality at the same time, and therefore compromising is necessary. In order to achieve higher efficiency, it is necessary to accept lower equality. Higher equality can only be achieved on the expense of lower efficiency, mainly because it usually decreases incentives necessary to increase the performance. Related to analysis in this paper, if the tradeoff holds true, that would imply that countries that are top performers in terms of high average literacy scores should at the same time have relatively high inequality of literacy scores and vice versa. Moreover, countries that want to increase their literacy test performance must accept rising inequality in literacy scores. In order to test this hypothesis,

median literacy test scores are compared to dispersion of literacy test scores measured by the ratio of the difference between the 95th percentile score and the 5th percentile score divided by the 50th percentile score (see Freeman *et al*, 2011). Figure 2 shows cross-country relationship between average (median) literacy scores and inequality in literacy scores. The relationship is negative and highly significant in both the mid-90s and 2011, which contradicts the equality efficiency tradeoff. Countries that have high performance and high average literacy scores have at the same time high equality of scores in both surveys (Sweden, Norway, Denmark and the Netherlands). The opposite is true for Italy, Ireland and the UK. The cross-country correlation coefficients are -0.98 in IALS and -0.90 in PIAAC. These results are in line with Freeman *et al* (2011) who use PISA numeracy scores, and also find positive relationship between student's math test scores and equality in scores in two PISA waves. Correlation coefficients in their analysis are slightly lower (-0.87 in 2000, and -0.75 in 2009). When looking at the changes between the two surveys (right diagram of the Figure 2), a certain pattern emerges as well. Countries that experienced a substantial drop in the average literacy scores (Denmark, Sweden, Norway, and Germany) experienced at the same time an increase in inequality in literacy scores. Italy, Ireland, the UK (and to a lesser extent) Finland improved their literacy scores and increased equality of literacy test scores at the same time; these countries didn't have to sacrifice their average performance for the sake of higher equality. The biggest outlier and the only country where the tradeoff holds is the US (and to a lesser extent the Netherlands). In the US equality in literacy scores increased, but that was combined with a significant drop in average performance (a change in the opposite direction happened in the Netherlands, albeit with the smaller size of the change). The situation in the US may be explained by the fact that whereas all the higher-skilled groups experienced a significant drop in scores (which lead to the overall drop in the average literacy scores), the lowest-skilled group experienced a tremendous increase in literacy scores (and this had a positive effect on skill inequality).⁷ Another outlier is Sweden; substantial drop in average literacy scores was accompanied by almost no change in skill inequality (however there is a slight increase which would be the movement in line with the rest of the countries). Again, here as well drop in scores wasn't driven by the change in the low-skilled group, but by the change in the high-skilled group.

⁷ See Figure 4

Figure 2: Average literacy scores and dispersion of literacy scores, IALS, PIAAC and change

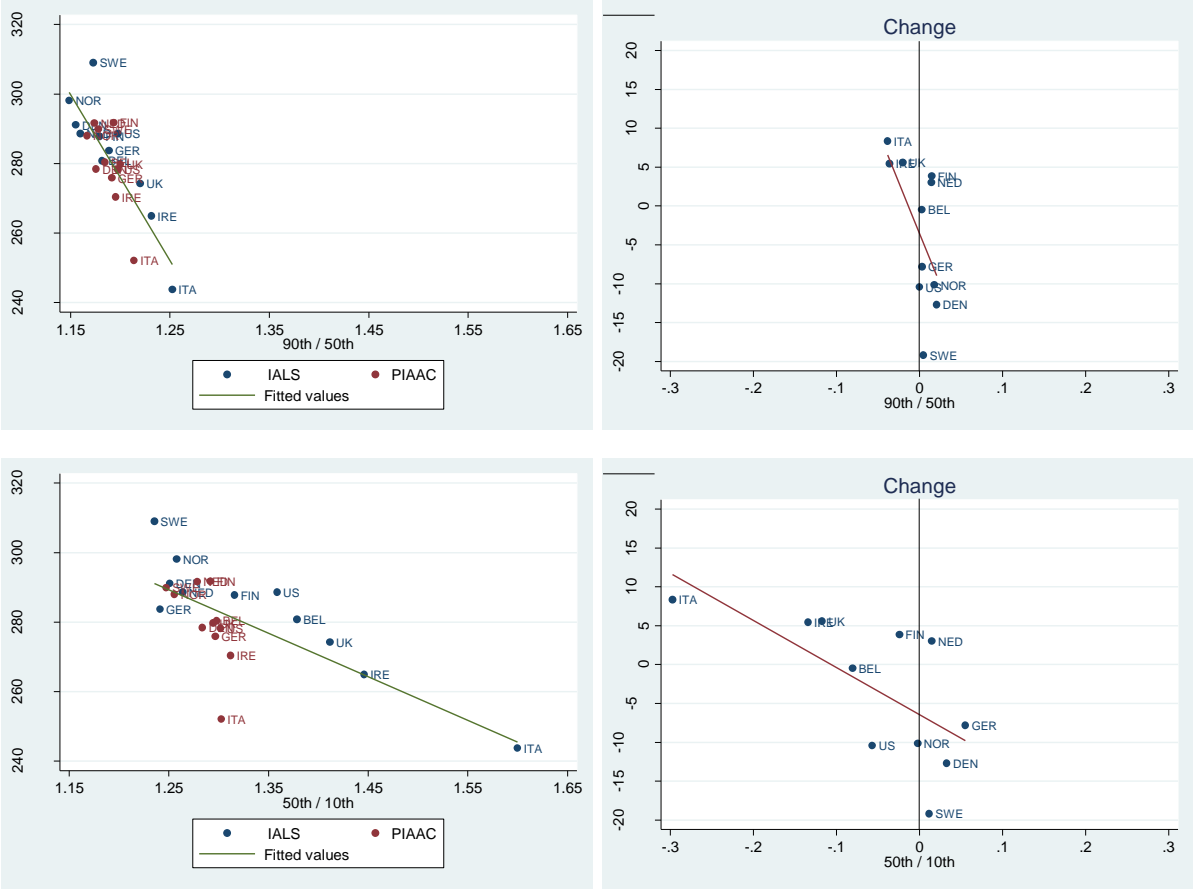


Source: Calculations based on IALS and PIAAC

In order to check the robustness of previous results, supplementary measures of dispersions are added. Figure 3 shows scatter diagrams that plot average literacy scores against additional standard measures of dispersion – decile ratios $D9/D5$ and $D5/D1$ ⁸. These diagrams are in line with the findings from the Figure 2. No matter which measure of dispersion is used, there is a significant negative relationship between average literacy scores and inequality in literacy scores. At the same time, changes between the surveys show that the countries that managed to reduce skill inequality, achieved this result by increasing the average skill level. The only individual countries where the results seem to be inconsistent are again the US and the Netherlands. Furthermore, looking at the decile ratios allows comparison of dispersion in the average literacy test scores in the bottom/top half of the score distribution. Some interesting facts become evident – inequality in scores is much more dispersed in the bottom half of the score distribution, especially in IALS. Changes in the score inequality were also more substantial in the bottom half of score distribution. Countries that at the same time managed to achieve higher scores and higher equality in scores, in fact improved equality of scores in the bottom half of the score distribution. On the other hand, countries that suffered substantial drop in average literacy test scores, experienced almost no changes in the top half of the score distribution, but slight losses in equality in the bottom half of the score distribution (apart from Norway where the opposite holds true).

⁸ Similar results are obtained if the coefficient of variation is used as a measure of dispersion

Figure 3: Average literacy scores and dispersion of literacy scores, IALS, PIAAC and change

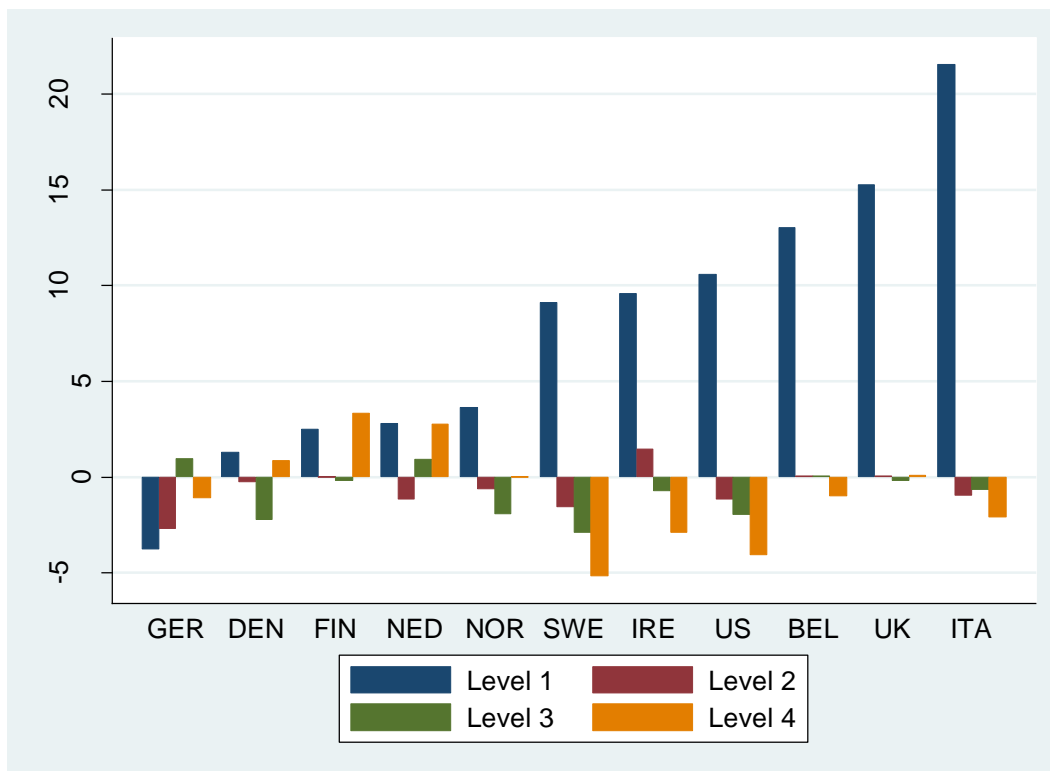


Source: Calculations based on IALS and PIAAC

The fact that top “performers” actually improved equality of scores in the bottom half of the score distribution, might imply that they achieved this result mainly by increasing average literacy scores and improving the average performance of the low-skilled. Figure 4 shows change between IALS and PIAAC in the average literacy scores by skill levels, and it confirms the previous assumption. Italy, the UK, and Ireland managed to improve the average literacy scores of the lowest-skilled adults by as much as 20, 15, and 10 points, and this was evidently the main driver of their overall average score increase. Their improvement would have been even higher, hadn’t these countries experienced a decline (although not that substantial) in all the other skill groups, which might pose a serious concern. Whereas there seems to be no particular pattern related to the countries that experienced drop in average literacy scores, at least it is possible to observe that in the lowest-skill group of these countries there was no substantial change. Germany is an exception and the only country where the

low-skilled adults suffered a drop in the average literacy scores (4 points), but Germany had the highest score to start with (top performer in IALS).

Figure 4: Change in literacy scores between IALS and PIAAC by skill level



Source: Calculations based on IALS and PIAAC

High literacy scores are associated with low inequality in literacy scores; an increase in the average literacy scores is associated with a decrease in inequality in scores, which further implies that high literacy scores are achieved by improving the performance of the adults in the bottom half of the score distribution. However, it is necessary to keep in mind that in order to get definite conclusions, more in-depth analysis is necessary. These results are descriptive and use a narrow measure of skill; however they can still provide some preliminary insight about the tradeoff between educational equality and educational efficiency.

4. Intergenerational educational mobility

While there is a debate about whether inequality of outcomes is necessarily negative for societies and economies, and it should be a matter of concern; most economists are worried about equality of opportunity. Inequality of opportunity is less tolerable than inequality of outcomes. In the world where equal opportunities exist, each individual has equal chances to use its potential fully, which should lead to higher productivity, employment and economic growth in a country. On the individual level, if there is an equality of opportunity, everybody who is talented, motivated and works hard should be able to develop its skills, and be rewarded for it by higher earnings and better employment opportunities. High equality of opportunity or high intergenerational mobility means that family background and socio-economic status of the parents should not be related to children`s success in life and work.

There are different ways to measure intergenerational mobility, the most common one being intergenerational income/earnings mobility (in economics literature), which examines the dependence of children`s income or wages to their parents` income and wages. On the other hand, intergenerational educational mobility is usually measured by estimating the relationship between parental education/years of schooling and their children`s education/years of schooling⁹. There is an extensive literature that deals with these two types of mobility (Björklund and Jäntti, 2009; D`Addio, 2007; Corak, 2006; Blanden *et al.*, 2005). This paper uses a slightly different approach; namely in order to determine how equal educational opportunities in different countries are, the effect of father`s educational level on their children`s literacy test scores is estimated. In countries where equality of educational opportunity exists, it is expected to find a low coefficient of the effect of parental educational level on their children`s literacy scores and vice versa. For the purpose of this analysis, father`s education level is used, which is standard in the similar literature and this is why it allows better comparability. However, the same results hold if mother`s education levels are used instead (there is only a slight difference in the size of the coefficients - in the case of IALS coefficients are slightly higher for fathers than mothers, whereas in PIAAC the opposite holds)¹⁰. Father`s education level is presented with a dummy variable which accounts for a father having the high education level (tertiary education or higher)¹¹. In order to estimate

⁹ Intergenerational earnings mobility and intergenerational educational mobility are related, given the strong association between education and earnings

¹⁰ All regression tables are available on demand.

¹¹ There are three education levels: low (upper secondary schooling), medium (secondary and post-secondary, non-tertiary education), and high (tertiary education or higher).

coefficients, OLS regression model of the following form has been estimated for both IALS and PIAAC surveys:

$$(1) \text{ scores}_i = \alpha + \beta \text{father's education}_i + C \text{ age}_i + D \text{ age}^2_i + F \text{ female}_i + u_i$$

Regression results are presented in Table 2. All the coefficients related to father's education level are highly significant. In IALS, having a father with a university degree or higher is associated with around 30 more literacy points in the pooled regression. Coefficients remain significant (but drop in half) even if the children's education level is additionally controlled for. In PIAAC, all estimated coefficients are highly significant as well. Children whose fathers have tertiary education score 30 points more on average. If children's own education is controlled for in the regression model, the size of the coefficients drops 15 points, but remain significant. Because of the strong link between education and wages, high estimated coefficient could mean that this high inequality in this society would lead to the even more inequality in the next generation. Furthermore, columns 3 and 4 show estimation results for quantile regressions for the adults at the 5th and 95th percentile of the score distribution. By estimating quintile regressions, it is possible to examine if the effect of father's education is different across the adults' ability distribution. Is the effect of having a highly educated father greater for the low- or high-skilled adults? Quantile regression coefficients are considerably higher at the 5th percentile of the skill distribution than at the 95th percentile of the skill distribution in both surveys (coefficient more than doubles). Fathers' background effects differ across the skill distribution of their children; being from an advantageous parental background is more important for less-skilled than high-skilled adults. This finding could also lead to conclusion that an increase in father's education leads to less inequality of opportunity; the effect of higher parental education is stronger in the bottom half of the skill distribution. The next section will look at the same issue from the countries' perspective. In all regressions, coefficients for squared age are significant and negative, mainly because scores fall with age exponentially (see Section 5). Female dummy is also significant and negative in all models and in both surveys. However, it is necessary to keep in mind that there are also unobservable factors as well, that are included in the coefficients (parents enthusiasm, readiness and competence to help their children). When estimating intergenerational mobility it is impossible to control for heritable ability, and the fact that more able fathers might have more able children who obtain higher literacy test scores. This is where cross-country analysis

becomes very useful, because there is no reason to assume that heritable ability, genetical factors, and intensity of parenting would vary across countries in some systematic way (Solon, 1999; OECD, 2010).

Table 2: Pooled regression of literacy test scores on fathers' education level in IALS and PIAAC

Variables	IALS				PIAAC			
	Scores	Scores	Quintile5	Quintile95	Scores	Scores	Quintile5	Quintile95
Father High Education	30.27 (1.13)	12.18 (1.08)	48.68 (3.78)	16.15 (1.67)	30.6 (0.56)	15.32 (0.53)	40.39 (1.42)	19.43 (0.98)
Age	2.03 (0.23)	1.19 (0.21)	1.66 (0.78)	2 (0.34)	0.89 (0.14)	0.37 (0.13)	0.2 (0.36)	1.15 (.25)
Age2	-0.04 (0.00)	-0.03 (0.00)	-0.04 (0.00)	-0.03 (0.00)	-0.02 (0.00)	-0.01 (0.00)	0.2 (0.00)	-0.02 (0.00)
Female	-3.67 (0.59)	-2.09 (0.55)	-0.56 (1.99)	-4.07 (0.87)	-3.02 (0.39)	-4.5 (0.35)	2.49 (0.98)	-5.36 (0.68)
Medium Education		35.64 (0.92)				24.25 (0.53)		
High Education		44.48 (0.75)				49.97 (0.53)		
Constant	262.37 (5.07)	267.09 (4.68)	189.78 (16.93)	321.58 (7.48)	274.88 (3.25)	255.8 (2.93)	211.53 (8.15)	332.6 (5.62)
R2	0.13	0.25			0.17	0.33		

Source: Calculations based on IALS and PIAAC

Note: Standard errors are in parentheses

4.1 Country regressions

Table 3 presents OLS regression coefficients (Equation 1) for individual countries in both surveys. Comparison of intergenerational educational mobility across countries could help us understand why country differences exist and what can be done in order to improve mobility. There is a substantial cross-country variation in the size of the coefficients. Fathers' tertiary education plays a different role in different countries. In the mid-90s, countries with the highest intergenerational educational mobility (and the highest equality of opportunity) were Germany, Belgium, Sweden, Norway and Denmark, and countries with the lowest intergenerational mobility were Ireland, Italy, UK and the US. In 2011 country ranking did not change considerably. The highest intergenerational educational mobility was evident in Sweden, Norway, Denmark and the Netherlands, and the lowest in the US, the UK, and Ireland. Scandinavian countries appear to be more successful in assuring equalities of opportunities than Anglo-Saxon countries, in both mid-90s and 2011 and these results are in

line with the literature on intergenerational earnings mobility (Björklund and Jäntti, 2009; Solon, 2002). Columns 2-6 of Table 3 show results of the quintile regressions (Equation 1) for adults at 5th and 95th percentile of the literacy score distribution. All coefficients are significant, apart from estimated coefficients for Belgium and Germany. As in the pooled regression model, cross-country coefficients are greater at the 5th quintile of the skill distribution than at the 95th quintile of the skill distribution in every country and in both surveys. Having a highly educated father is related to higher test scores for the low-skilled than for the high-skilled adults. That means that improving the education levels of fathers have stronger effects on the low-skilled adults than on the high-skilled adults. Consequently, increasing the parental education levels would lead to a decline in the skill inequality.

Table 3: Country regressions of literacy test scores on fathers' education level in IALS and PIAAC

Quintile	Quintile 5		Quintile 95		Quintile 5	Quintile 95
Country	Father tertiary	Father tertiary	Father tertiary	Father tertiary	Father tertiary	Father tertiary
Survey	IALS			PIAAC		
BEL	18.55 (6.67)	26.28 (16.48)	-0.26 (6.36)	31.21 (2.02)	48.26 (4.48)	15.15 (2.98)
DEN	23.02 (2.34)	40.23 (6.72)	16.85 (3.63)	26.52 (2.10)	30.43 (3.43)	18.83 (2.31)
FIN	31.90 (5.35)	43.26 (12.79)	22.89 (6.99)	28.22 (2.70)	33.4 (5.23)	22.11 (3.77)
GER	17.67 (5.58)	15.31 (10.44)	11.74 (6.06)	31.99 (3.47)	35.44 (7.20)	19.14 (3.43)
IRE	41.45 (7.65)	70.39 (18.84)	33.35 (10.81)	34.61 (2.65)	42.38 (5.59)	22.27 (3.45)
ITA	35.51 (6.31)	47.62 (11.97)	10.86 (6.67)	30.98 (4.97)	30.55 (7.83)	21.67 (4.92)
NED	22.27 (3.02)	29.08 (7.55)	12.89 (3.58)	25.71 (2.08)	34.51 (4.78)	15.37 (2.55)
NOR	21.96 (2.48)	47.01 (7.23)	9.8 (3.43)	24.32 (1.82)	30.77 (4.23)	18.36 (2.78)
SWE	18.55 (4.97)	22.82 (10.30)	9.77 (5.11)	21.62 (2.17)	26.21 (3.91)	20.19 (2.88)
UK	36.67 (5.40)	44.71 (11.90)	19.15 (4.55)	35.50 (2.75)	43.98 (3.94)	22.75 (2.52)
US	34.23 (4.32)	64.81 (9.21)	13.6 (5.30)	44.58 (2.90)	40.34 (5.44)	38.04 (3.55)

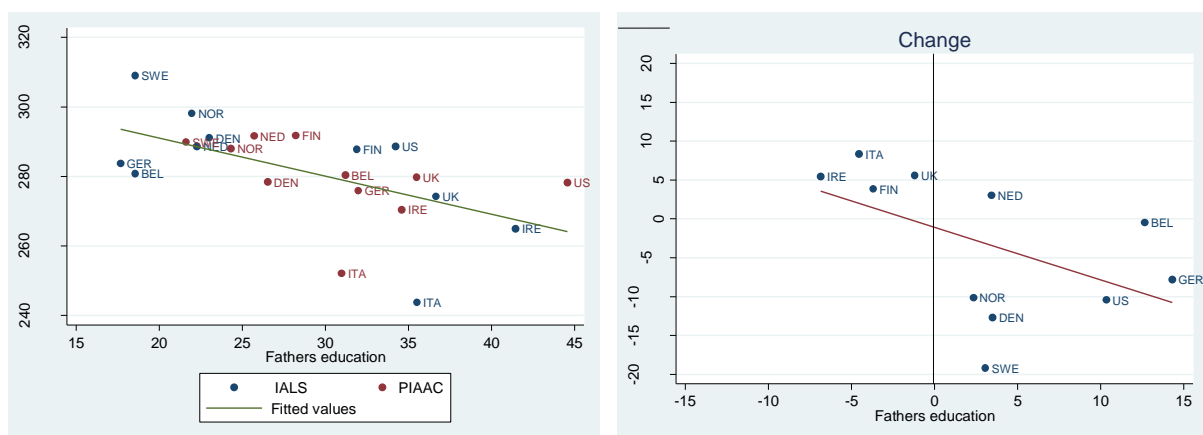
Source: Calculations based on IALS and PIAAC

Note: Standard errors are in parentheses

Previous regression results showed that there is a substantial cross-country variation in intergenerational educational mobility. In the next step, it is essential to examine if the cross-

country differences in intergenerational educational mobility are related to cross-country differences in the average test performance. Figure 5 plots regression coefficients (for fathers having tertiary education or higher) of the equation 1 against the average (median) literacy test scores, for all individual countries and for both surveys. The relationship is significant and positive in both IALS and PIAAC (the correlation coefficients are -0.76 and -0.57, respectively). Countries that have high intergenerational educational mobility have on average high average literacy scores as well (PIAAC: Sweden, Norway, Denmark and the Netherlands, IALS: Germany, Belgium, Sweden, Norway and Denmark), and countries with the lowest intergenerational mobility and the lowest average scores are the US, the UK, and Ireland (IALS: Ireland, Italy, the UK, and the US). Changes between two surveys also show a certain pattern. Countries that improved the average literacy scores, experienced an increase in intergenerational educational mobility (Ireland, Italy, Finland, and the UK), whereas countries that experienced decline in average literacy scores (Norway, Denmark, Sweden, the US, Germany and to lesser extent Belgium) experienced at the same time decrease in intergenerational educational mobility and equality of opportunity. To conclude, increases in the literacy test scores are positively associated with an increase in intergenerational educational mobility, and equality of opportunity.

Figure 5: Average literacy scores and estimated coefficients of fathers' education levels on their children's literacy scores, IALS, PIAAC and change



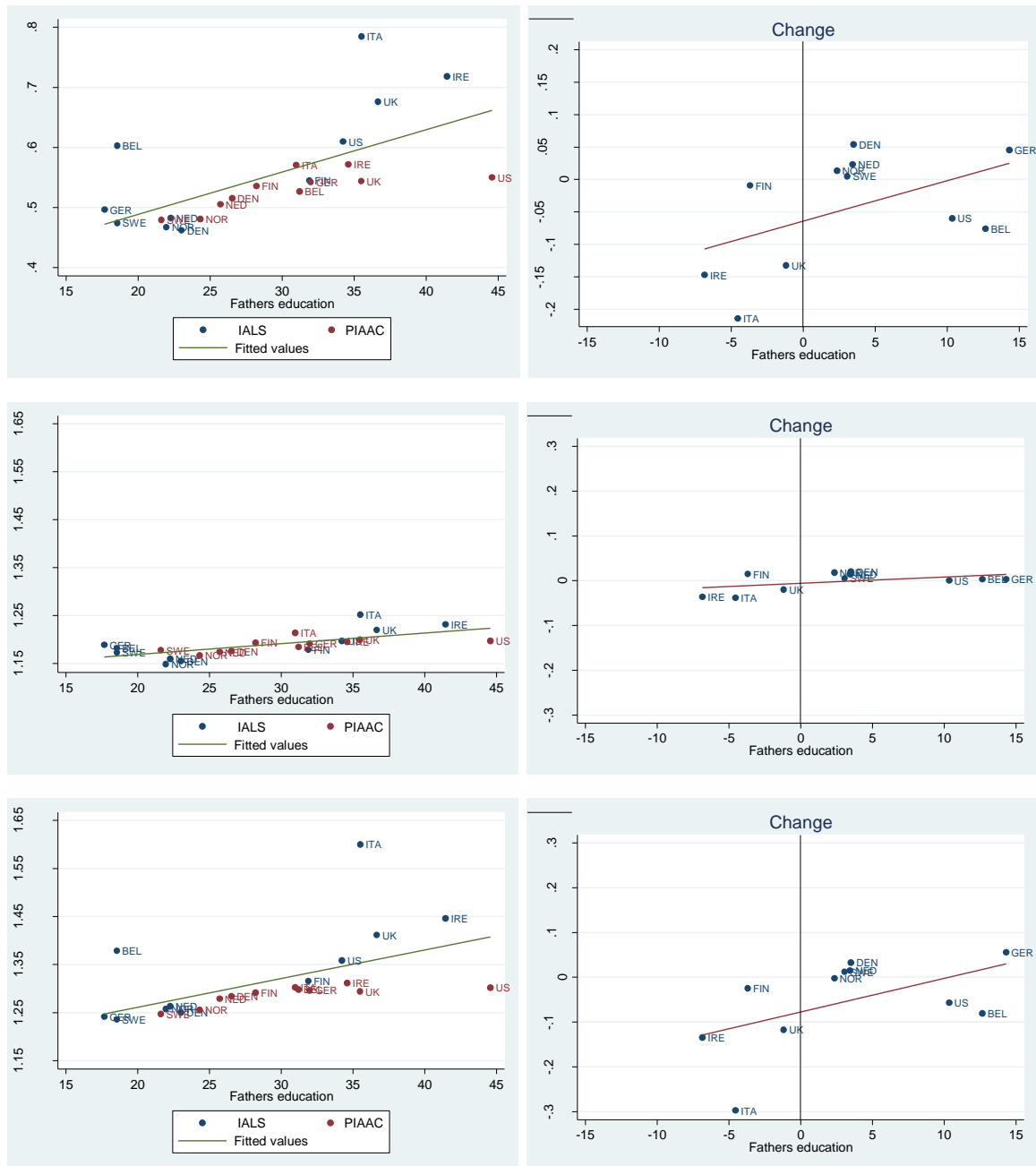
Source: Calculations based on IALS and PIAAC

Lastly, it is interesting to analyze if there is an association between equality of educational outcomes and equality of educational opportunities by checking if there is a relationship

between estimated coefficients of fathers' education and their children's dispersion of literacy scores (measured by 95th-5th/50th, 90th/10th, and 50th/10th ratios. Figure 6 shows these variables for both surveys and their changes. In both surveys there is a significant negative relationship between intergenerational educational mobility and the dispersion in the literacy test score¹². Countries in which intergenerational educational mobility is low (the US, the UK, Ireland and Italy) have at the same time relatively high dispersion of literacy test scores. On the other hand, Scandinavian countries, the Netherlands and Germany (IALS) have low score dispersion and high mobility. Change is showing the similar pattern along the same lines. Countries in which skill inequality increased (Norway, Sweden, Denmark, Germany and the Netherlands) exhibited at the same time decrease in intergenerational educational mobility (an increase of the effect of fathers' education on their children's test scores). The UK, Italy, Ireland and Finland experienced the movements in opposite directions. This result might be interpreted as a sign that low mobility creates higher levels of inequality. Since there is a strong link between skills/education and wages, it is easier for rich families to transmit their benefits to the next generation (and makes it harder for the poor families to foster their children). Decile ratios reveal some important insights regarding the differences in the strength of the relationship across the skill distribution. The positive association between equality of opportunity and equality of outcomes is higher in the bottom half of the score distribution. Countries that have high equality in the bottom half of the skill distribution have at the same high equality of opportunity and vice versa. Increasing equality of scores at the bottom, contributes to the high equality of opportunity overall. The only two outliers are the US and Belgium, countries where decrease in skill inequality (driven by decrease in skill inequality in the bottom half of the skill distribution) was coupled with a decrease in intergenerational educational mobility.

¹² The correlation coefficients are 0.92, 0.87, and 0.89, respectively.

Figure 6: Dispersion of literacy scores and estimated coefficients of fathers' education levels on their children's literacy scores, IALS, PIAAC and change



Source: Calculations based on IALS and PIAAC

To conclude, based on the international comparison of two surveys of adult literacy skills, this descriptive analysis showed that higher average literacy skills are positively associated with greater skill equality and greater intergenerational educational mobility. Countries that have high average literacy test performance have at the same time high equality of test scores and high intergenerational educational mobility. Although descriptive, these results might offer a

preliminary indication that literacy skills are a good equalizer in both educational outcomes and educational opportunities. By improving the average literacy skill levels, countries could benefit through reducing the impact of fathers' education levels on their children's skills. Policy implication of this result is very straightforward; countries should maximize their efforts and foster policies to raise average literacy skills (especially by improving the literacy skills of the low-skilled adults). These policies are extremely beneficial, and equalizing educational outcomes and opportunities can be achieved without an expense of lower average test performance. However, it is firstly vital to find out what lies behind these cross-country differences in the average literacy scores and changes in their literacy scores.

5. Country differences in average literacy scores and their changes between IALS and PIAAC

In order to shed light on the differences in the average literacy scores and their changes across countries, in the following section firstly the differences in the distribution of literacy skills, and demographic characteristics between IALS and PIAAC are analyzed. As shown previously, there are countries where average literacy scores declined and other where scores increased in the period between two surveys; these changes were associated with changes in equality of educational outcomes and educational opportunities. What lays behind these changes? As shown in Section 1, one reason that can partly explain these differences is related to differences in the shares of immigrants and their changes (and this is why only native population was kept in the further analysis). Table 4 shows summary statistics of literacy scores (immigrants are excluded).

Table 4: Summary statistics of literacy scores, PIAAC, IALS and their change (25-65)

Survey		IALS (1996)			PIAAC (2011)			Change	
Country	Mean	Median	St.Dev.	Mean	Median	St.Dev.	Mean	Median	
BEL	273.66	280.83	50.67	276.66	280.36	45.3	3	-0.47	
DEN	287.12	291.09	41.67	274.53	278.40	44.31	-12.59	-12.69	
FIN	282.62	287.84	47.81	288.62	291.68	48.66	6	3.85	
GER	282.78	283.64	42.71	272.95	275.85	45.73	-9.83	-7.79	
IRE	258.88	264.91	57.09	266.63	270.36	47.33	7.75	5.45	
ITA	236.31	243.77	58.03	250.7	252.11	43.77	14.39	8.34	
NED	284.55	288.65	42.87	287.81	291.65	45.04	3.26	3.01	
NOR	293.24	298.12	42.7	284.65	287.96	42.4	-8.59	-10.15	
SWE	306.96	309.03	45.09	288.27	289.88	42.49	-18.69	-19.15	

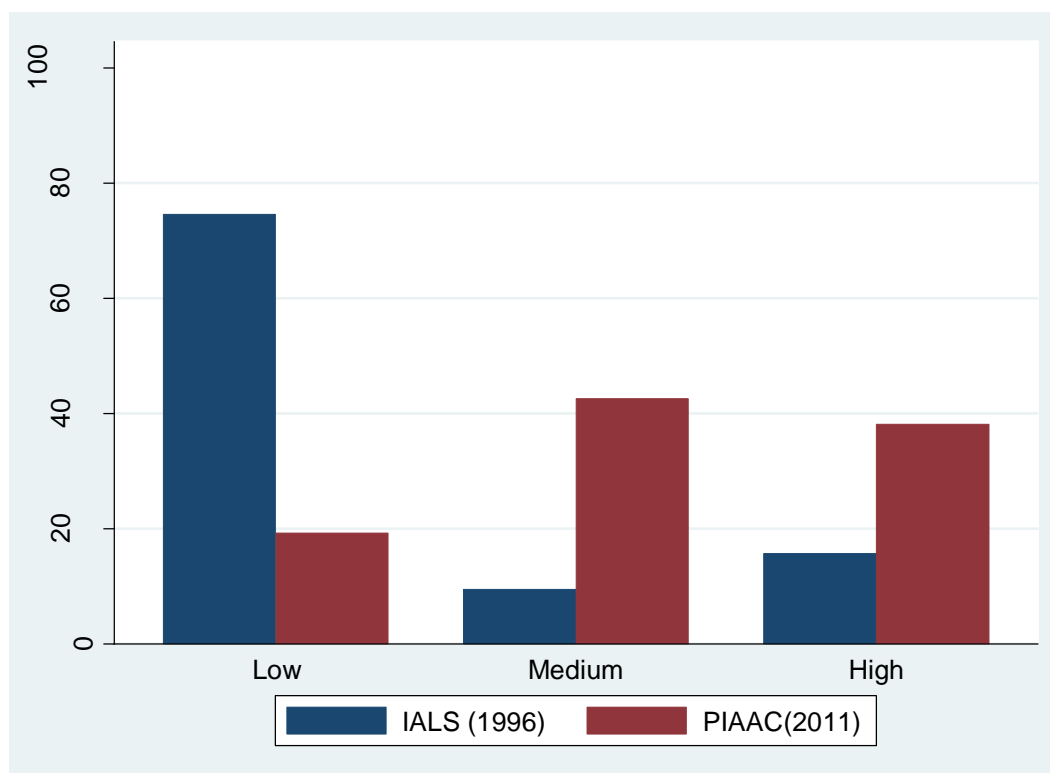
UK	267.95	274.17	56.86	277.15	279.77	47.09	9.2	5.59
US	283.01	288.63	53.21	275.34	278.22	46.68	-7.67	-10.41
Pooled	277.92	282.79	48.97	276.67	279.66	45.35	-1.25	-3.13

Source: Calculations based on IALS and PIAAC

According to Table 4, there are substantial cross-country differences in the average literacy scores and their changes. Literacy scores are on decline in five countries, two countries show no substantial change, and some improvements are evident in only four countries. Before it is necessary to go deeper into analysis, there are some obvious reasons that could explain these changes, and there are the first ones to be dealt with. As explained previously, both surveys are based on the representative population in the relevant time periods; however representative population could have changed significantly between the surveys. In order to understand the data better, it is important to see if there was a substantial change (apart from immigration) in age, education levels etc. of representative population in the participating countries which might potentially explain these differences.

The fact that literacy scores didn't improve substantially in majority of countries becomes even more surprising when changes in education levels are observed. Figure 9 shows shares of population by education level in the pooled sample. Whereas in IALS majority of people had low education level (upper-secondary schooling), in PIAAC this group has the smallest share and there was a decrease of at least 40% in all individual countries. At the same time, this decrease was compensated by an increase in the medium education level (secondary and post-secondary, non-tertiary education) and high education level (university degree or higher). On average, education became more important and especially acquiring a university degree. The same pattern is evident in each individual country in the sample. In order to solve this puzzle is it essential to answer the question of how strong the relationship between education levels and scores is.

Figure 9: Share of population by education level, IALS and PIAAC (25-65)



Source: Calculations based on IALS and PIAAC

According to the human capital theory, higher education levels should be able to produce better skills (which should then lead to higher wages). In order to investigate the relationship between education and literacy scores a following OLS regression model is estimated (in the pooled sample). Table 5 shows regression coefficients of literacy test scores on education levels in IALS and PIAAC (controls are age, age² and female). In both surveys higher education levels are associated with higher literacy scores, as expected. Individuals with medium education levels have on average 38 points (IALS) and 26 points (PIAAC) more points than the reference group (low education level). Having a tertiary degree or higher is related to 48 (IALS) and 55 (PIAAC) additional literacy scores comparative to the scores of adults with only upper-secondary degree. Higher education levels lead to higher literacy scores and better skills. However, whereas in 2011 tertiary degree succeeded to produce even higher literacy scores than around 15 years ago, this was not the case for the secondary and post-secondary degrees. Results for individual countries show the same pattern; return on medium education level in terms of number of literacy points got smaller in 2011 comparative

to the mid-90s¹³. Although there was a significant educational expansion in all countries, average literacy scores didn't improve considerably in most countries (in some countries they even declined). What could be the reason for this finding?

Table 5: Pooled regression of literacy test scores on education levels in IALS and PIAAC

Survey	IALS	PIAAC
Medium Education	38.14 (0.92)	26.32 (0.52)
High Education	48.52 (0.73)	55.25 (0.51)
Age	1.14 (0.22)	0.2.(0.13)
Age2	-0.02 (0.00)	-0.01 (0.00)
Female	-2.02 (0.55)	-4.71 (0.35)
Constant	267.96 (4.66)	260.43 (2.91)
R2	0.25	0.30

Source: Calculations based on IALS and PIAAC

Note: Standard errors are in parentheses, low education level is taken as a reference

Another demographic factor that might affect average literacy scores and their changes is age structure of the population. Population ageing is a big problem in all countries, but particularly so in the Western Europe and Scandinavia. Figure 7 reports share of population by age groups in the pooled sample. Whereas in the mid-90's shares of population in age groups 25-34 and 35-44 were higher than shares of population in the older age groups (45-54 and 55-65), this trend reversed itself in 2011. The most important change in representative population between two surveys happened in the oldest age group (55-65), whose share in the overall population increased in all countries. However, there are some cross-country differences in the share of old age groups and their changes. Thus, population ageing had negative effect on the average literacy scores, because literacy skills decline with age in all countries (see Figure 8). One should nevertheless be careful about interpreting these results as an age effect, since older age groups have lower education levels as well. Furthermore, one should also bear in mind that these results are related to literacy skills only (certain type of skills), which usually get higher shortly after leaving school, but decline afterwards. Experience increases with age, and so do probably other types of skills that are not captured in the measure of literacy skills, which explains why matured adults earn higher wages.

¹³ OLS regression tables for individual countries are available on demand.

Figure 7: Share of population by age group, IALS and PIAAC (25-65)

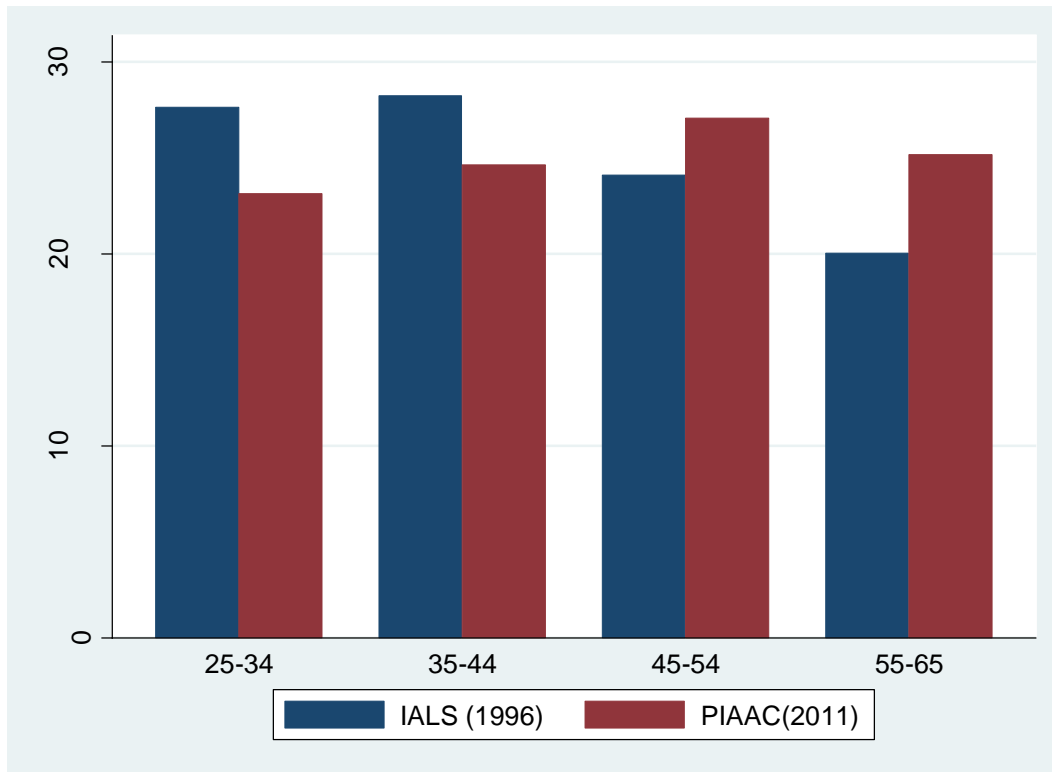
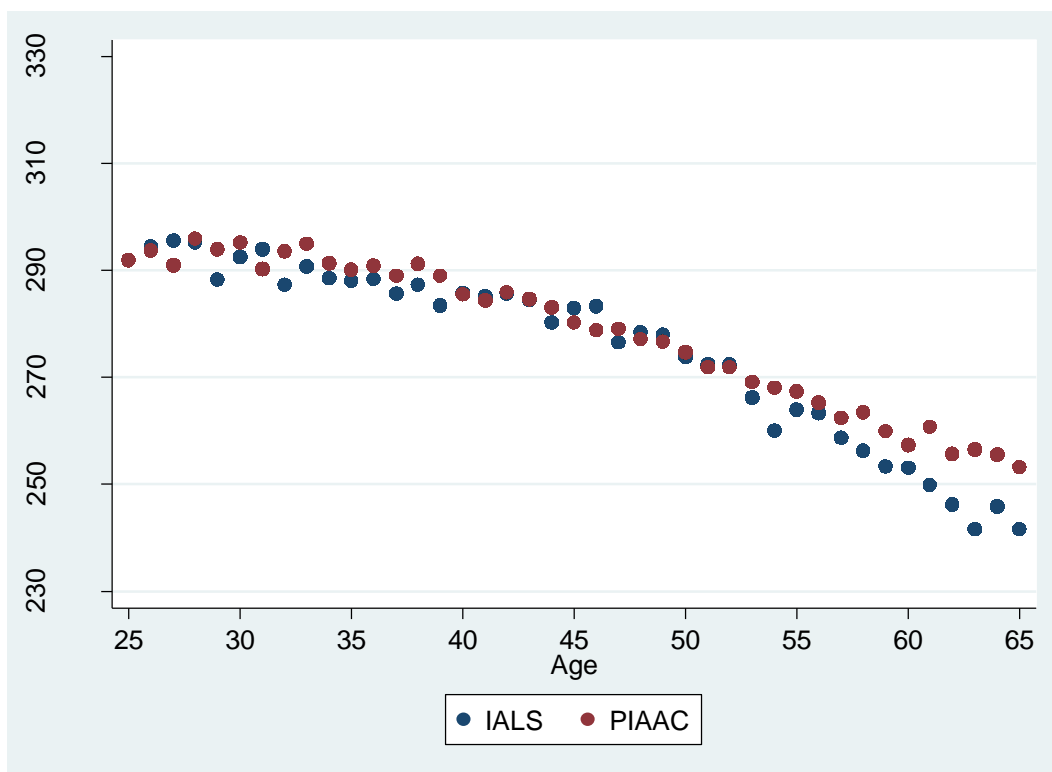


Figure 8: Literacy Scores and Age, IALS and PIAAC (25-65)



Source: Calculations based on IALS and PIAAC

5.1. Age, Cohort and Score Effects

How literacy scores change with age is important especially in times of substantial population ageing. Figure 8 showed that literacy skills tend to decline with age. Possible reasons for the negative relationship between literacy skills and age, are age effects (skills of 45 year-old adults are lower than skills of 35 year-old adults because of the age) or cohorts effect (35 and 45 years-old adults were born 10 years apart and they have received different schooling quality, parental and peer influence and different social and technological settings). The problem with these types of surveys is that it is not possible to distinguish between the two effects, since this is not a panel data set that allows following one person over period of time. However, there might be another way to deal with this issue. In order to investigate how big the age effect is, it is necessary to control for cohort effect. By matching birth cohorts in both surveys (creating synthetic cohorts), it is possible to follow the same birth cohorts in both surveys and account for unobserved differences between countries and cohorts as well as differences in distributions. In this data set it is possible to match two cohorts: 29-38 years old (IALS) with 45-54 years old (PIAAC), and 39-48 years old (IALS) with 55-64 years old (PIAAC)¹⁴. As emphasized earlier, both surveys are based on representative populations of the adults. Table 5 shows mean literacy scores by above mentioned age cohorts. Average literacy test scores declined in all countries and in both cohorts, and these changes in literacy scores can be attributed to age effects. Furthermore, age effect appear to accelerate with age (cohort 2 suffers more significant decline in scores than cohort 1 in all countries). The skill decline was especially pronounced in countries that suffered overall decline in scores: Denmark, Germany, Norway, and Sweden. Cohort results support cross-country results, however, the decline in skills is even greater than in the mean results (see Figure 1). Age effect is underestimated in the mean results; mean scores are higher due to a substantial increase in education. According to the analysis presented here, in the past fifteen years there was a considerable educational expansion, but at the same time average scores did not improve everywhere (although higher education levels are related to higher scores). Previous results also showed that population ageing had substantial negative effect on average literacy scores. How big are these two effects and which effect dominates? Can these two effects explain fully the difference in scores, or is there some other effect that isn't captured by these two factors, but is still important in explaining differences in average literacy scores and their changes between the surveys?

¹⁴ Birth years of these cohorts are 1957-1966 and 1946-1956 respectively. Since IALS was done between 1994 and 1998 age can vary (+/-2) across countries, depending on the year of survey.

Table 5: Literacy scores by cohorts, IALS and PIAAC

Country	Cohort 1		Cohort 2		Cohort 1	Cohort 2
	IALS	PIAAC	IALS	PIAAC	Difference	Difference
BEL	286.34	274.22	275.50	256.39	-12.12	-19.11
DEN	298.27	270.50	291.90	255.16	-27.77	-36.74
FIN	300.32	287.72	282.67	261.20	-12.59	-21.47
GER	291.06	268.23	285.72	256.97	-22.84	-28.76
IRE	270.45	259.95	264.79	249.71	-10.50	-15.08
ITA	249.76	250.27	240.80	233.83	0.52	-6.97
NED	300.80	283.89	289.50	265.73	-16.91	-23.76
NOR	304.93	281.68	294.89	263.37	-23.25	-31.51
SWE	322.21	285.77	310.50	269.49	-36.44	-41.01
UK	279.46	272.64	276.24	267.15	-6.82	-9.09
US	289.52	272.67	287.25	268.18	-16.85	-19.07
Pooled	284.49	270.00	280.80	261.92	-14.49	-18.88

Source: Calculations based on IALS and PIAAC

One possible way to determine which factors contributed the most to the changes in average literacy scores is to decompose the score difference by country. For this purpose, differences in scores between IALS and PIAAC are being decomposed into changes that come from changes in literacy scores in the same age-education groups (score effect), changes that come from a change in the age-education structure (their shares), and changes that comes from their interaction (see Equation 2). Table 6 reports results of the above-mentioned decomposition method. Column four of the Table 6 shows that the changes in age education structure (shares) had positive effect on differences in scores, and this is a consequence of an increase in education levels across countries (substantial decline of the share of adults with low education level). However, results in the third column of the Table 6 clearly show that the score effect seems to be the most significant factor in explaining score differences in all countries. People in the same age-education group simply have as high as 30 points lower scores (Germany, Sweden, and Denmark) in PIAAC than in IALS. Particularly countries that

suffered drop in the overall average literacy scores, had the highest score effects and vice versa. This substantial drop in literacy scores in the same age-education group is a big concern and implies that there is a considerable unexplained effect. The existence of the unexplained score effect might lead to a conclusion that educational efficiency is on decline in all countries, but even more so in the countries that experienced the biggest drop in the average literacy scores. Moreover, as shown previously, this result is driven rather by the drop in the efficiency of the medium education level than the high education level (see Table 5).

$$Score_{PIAAC} - Score_{IALS} = \sum_{ij} a_{ij} * \Delta Score_{ij} + \sum \Delta a_{ij} * Score_{IALS_{ij}} + \sum \Delta a_{ij} * \Delta Score_{ij}$$

Table 6: Decomposition of score difference by country

Country	Difference	Age-educ group	Age educ structure	Interaction effect
BEL	-6.68	-23.16	16.09	0.39
DEN	-14.76	-31.57	12.33	4.47
FIN	6.29	-9.81	21.57	-5.48
GER	-7.37	-42.44	19.13	15.93
IRE	11.55	-16.25	30.64	-2.85
ITA	7.55	-7.17	10.32	4.40
NED	-0.75			
NOR	-9.05	-24.18	17.26	-2.13
SWE	-16.19	-33.78	15.54	2.05
UK	8.31	-22.06	27.93	2.43
US	0.21	-26.78	23.26	3.72
POOLED	-0.58	-22.86	21.55	0.73

Source: Calculations based on IALS and PIAAC

Although immigration, population ageing, and changes in education levels across countries explain part of the change in the average literacy scores, further analysis indicates that a

certain unexplained part of literacy score difference still remains. Whereas education exhibit positive effect and age negative effect on the average literacy scores, score effect accounts for the biggest part of the literacy score differences which might indicate that educational efficiency is on decline in most countries. However, some more in-depth analysis is necessary to confirm these findings.

7. Conclusion

Based on the international comparison of two surveys of adult skills conducted in the mid-90s and 2011, this paper shows that higher literacy skills are positively associated with greater skill equality and greater intergenerational educational mobility. Countries that have good average test performance have at the same time high equality in literacy test scores, which contradicts efficiency equality tradeoff. At the same time these countries tend to have greater intergenerational educational mobility (measured by the effect of fathers' education on their children's literacy test scores). Quantile regressions confirm this finding; having a highly educated father has equalizing effects on both educational opportunities and educational outcomes of their children. These results have very important policy implications. Adult skills can be used as an equalizer in both educational outcomes and educational opportunities (in this paper we focused on literacy skills only, but there is a high correlation between literacy and numeracy test scores). By increasing average skill levels (especially by improving skills of the low-skilled adults), countries can improve equality of educational outcomes and equality of educational opportunity.

In order to find out what lays behind the differences in the average literacy scores and their changes, this paper was examining cross-countries differences in the average literacy scores and their change between the mid-90s and 2011. Demographic differences and their changes like immigration, age, and education have significant effect on cross-country differences in scores and changes in scores. Whereas population ageing affects average literacy scores negatively, higher education is positively associated with higher skills levels. Higher education levels produce better skills, although the correlation coefficient is somewhat lower than expected or desired. Furthermore, despite this tremendous educational expansion, literacy scores remained constant in the pooled sample. Further analysis showed that when controlled for education and age, an unexplained part of differences in literacy skills remains that might be ascribed to decrease in educational efficiency in all countries. From a policy perspective,

countries need to find ways to implement measures and policies that would lead to higher correlation between education and literacy skills (necessary to succeed in work and society), and will lead to an increase in educational efficiency. Rise in educational attainment alone is not enough; higher government expenditure in education must also be focused on educational reform, on improving quality of education, and improving access to everybody. Investing in skills throughout the life cycle would be beneficial as well. However, early childhood welfare, and family policies, as well as the active role of welfare state (social spending and redistribution) might be equally important in order to reduce inequalities.

Nevertheless, it is important to bear in mind that a cross-country analysis is rather problematic. There is only a small number of countries, and these countries differ in many aspects. Although there was an effort to create a homogeneous sample of 11 advanced countries in both surveys, important differences between countries still remain. Furthermore, results presented here are correlational, descriptive, and they do not prove causality. Measure of skill used in this paper is very narrow, and results obtained here might not be in line with the results obtained when other skill measures are used. Another potential problem is related to possible measurement issues that might have occurred when linking two surveys (although OECD claims results are comparable). However, these preliminary results offer some starting points, and provide first insights about these important policy topics. For the further analysis, it would be crucial to comprehend where the differences in equality of outcomes and opportunities come from, what the differences between educational systems, institutions, and policies in specific countries are, and what their effect on inequalities, and educational efficiency might be.

References

Björklund, A. and Jäntti, M. (2009) 'Intergenerational Income Mobility and the Role of Family Background'. In Salverda, W., Nolan, B. and Smeeding T. (eds), *The Oxford Handbook of Economic Inequality*, Oxford, UK, Oxford University Press.

Blanden, J., Gregg, P. and Machin, S. (2005) 'Intergenerational Mobility in Europe and North America', report supported by the Sutton Trust, Centre for Economic Performance, London School of Economics.

Card, A. (1999) The causal effect of education on earnings. In: Ashenfelter, O. and Card, D. (eds.) *Handbook of Labor Economics*, Volume 3A: 1801-1863, Amsterdam, Elsevier.

Corak, M. (2006) *Do Poor Children Become Poor Adults? Lessons from a Cross Country Comparison of Generational Earnings Mobility*, IZA Discussion Paper, Bonn, Institute for the Study of Labor.

D'Addio, A. C. (2007) *Intergenerational Transmission of Disadvantage: Mobility or Immobility Across Generations?*, OECD Social, Employment and Migration Working Papers No. 52, Paris, OECD Publishing.

Devroye D, and Freeman RB (2001) Does Inequality in Skills Explain Inequality in Earnings Across Advanced Countries?. NBER Working Paper 8140, National Bureau of Economic Research, Cambridge, MA

Freeman RB, Machin S, Viarengo M (2011) Inequality of educational outcomes: international evidence from PISA. *Regional and Sectoral Economic Studies* 11(3): 5-20

Freeman RB, and Schettkat R (2001) Skill compression, wage differentials and employment: Germany vs the US. *Oxford Economic Papers* 3: 582-603

Jovicic, S. (2016) *Wage inequality, skill inequality, and employment: evidence and policy lessons from PIAAC*, *IZA Journal of European Labor Studies*, Vol 5, No 21.

Jovicic, S. and Schettkat, R. (2013) *Does Inequality Promote Employment? An International Comparison*, Schumpeter Discussion Papers No. 2013-010, Wuppertal, University of Wuppertal library.

OECD (2013) *OECD Skills Outlook*, OECD Publishing, Paris

OECD (2013) *Technical Report of the Survey of Adult Skills (PIAAC)*. OECD Publishing, Paris

OECD (2013) 'Relationship of the Survey of Adult Skills (PIAAC) to other international skill surveys'. In *The Survey of Adult Skills: Reader's Companion*, OECD Publishing.

OECD (2012a) *Better Skills, Better Jobs, Better Lives*. OECD Publishing, Paris

OECD (2012b) *Education at a Glance 2012: OECD Indicators*. OECD Publishing, Paris

OECD (2010) *Learning for Jobs*. OECD Publishing, Paris

Okun, A. (1975) *Equality and Efficiency: The Big Tradeoff*. Washington D.C.: Brookings Institution.

Solga, H. (2014) Education, economic inequality and the promises of the social investment state, *Socio-Economic Review* 12, pp 269-297

Solon, G. (1999) 'Intergenerational Mobility in the Labor Market'. In Aschenfelter, O. and Card, D. (eds) *Handbook of Labor Economics*, Vol 3A, pp. 1761-1800.

Solon, G. (2002) "Cross-country differences in Intergenerational Earnings Mobility". *Journal of Economic Perspectives* 16 (3):59-66

Tyler J, Murnane R, Willet J (1999). *Do the Cognitive Skills of School Dropouts Matter in the Labor Market?* NBER Working Paper No. 7101, Cambridge, MA, National Bureau of Economic Research

Woessmann L (2004), How Equal are Educational Opportunities? Family Background and Student Achievement in Europe and the US, CESifo Working Paper Series No. 1162