An analysis of inequality of skills achievement among adults using PIAAC 2012

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This paper analyses how the distribution of post-compulsory education between individuals and social groups affects skills among adults in OECD countries. The paper is based on data collected by the Survey of Adult Skills 2012 (PIAAC) which measures proficiency in literacy, numeracy and problem solving within 23 OECD countries and sub-national units. In order to gain an understanding of the relationship between different potentially explanatory factors of numeracy and literacy scores in PIAAC, we decompose variance through different blocks of predictors such as demographics, socioeconomic backgrounds, education, employment, on the job training and skills practices. The results show that even after accounting for all factors, education remains the most important predictor of literacy and numeracy proficiency among adults in countries examined. Moreover, the fixed effect model reveals that in all countries the total effect of education on skills is partially explained by the unequal distribution of education among individuals from different socioeconomic backgrounds. This paper explores differences in individual and social background in comparative perspective and points out how those intergenerational inequalities are still influencing individual skills.

Keywords: skills, inequality, education, PIAAC, numeracy.

INTRODUCTION

Since the introduction of international comparative assessment on educational competence, a number of studies have attempted to identify major factors influencing the acquisition, development and maintenance of literacy and numeracy proficiency. Presumably, the interest arises from the assumption that literacy and numeracy are crucial to communication and facilitates personal, social, and economic development. In other words, literacy and numeracy proficiency are basic and crucial skills for an individual to function in society. The outcomes of literacy and numeracy are thought to be pervasive, involving potential benefits such as health, personal and intellectual effects, as well as economic success (OECD, 2013). Accordingly, social scientists need to better understand what works in raising skill levels, as well as the social and economic returns to improvement and the nature of its role in society. Many fundamental research questions in adult education involve change over time: how adults learn, how program participation influences their acquisition of skills and knowledge, and how their educational development interacts with their social and economic performance.

From an individual point of view, people with higher levels of education are not only more likely to have better outcomes in the labour market in terms of employment and wages (Hanushek et al., 2013; Harmon et al., 2003), but also experience a better level of health, fertility, a higher level of welfare, are less likely to engage in criminal activities and non-monetary benefits (Checchi et al, 2014; Grossman, 2006; Oreopulos and Salvanes, 2011). Moreover, education has indirect effects on broad macro-levels, generates benefits not only private but also public. Rising levels of education have been positively associated with economic growth, social cohesion and civic and political participation (Hanushek and Kimko 2000). The level of education is strongly associated with family background and varies widely between countries and over time in response to the specific institutional setting in which education systems operate.

From a social policy perspective, institutional characteristics affect the accumulation of human capital for different countries. In this sense, the Program for International Assessment of Adult Competences (PIAAC) survey is a data source that gives rise to a global analysis of the results of educational systems, not only in terms of number of years of schooling, but also in terms of the quality of education attained by a population. It is common for there to be inequality in the distribution of education credentials (meaning, different education levels attained translate to different standards of literacy proficiency and where one country may provide higher proficiency in secondary school another may not. Moreover, differentiation might be produced in other steps of education attainment, like tertiary education). Not only does the level of education attained affects human capital but also the lack of standardization among education credentials means that some adults may be prevented from acquiring new skills and training necessary to compete in a demanding labour market.

Against this background, OECD and other international organizations have produced different skills-based global assessments in order to gain an understanding of skills distribution. PIAAC provides information about large samples of adults between the ages of 16 and 65 in 24

countries and allows for large analyses of complex explanations of education attainment gap in a cross-national setting. It measures demographic and socio-economic characteristics and provides direct measures of literacy and numeracy.

In this paper we use direct measures of literacy and numeracy proficiency as measured in PIAAC to estimate the relationships between document literacy and numeracy and a number of factors which are relevant to variation in skills among adults, within a comparative perspective[1]. Some of these factors – for instance, the use of numeracy and literacy-related practices – have not been extensively explored. This paper also deals with factors such as age, gender, country of origin (or nationality), education, employment status, occupation classification, and competence at work, in order to see how relevant they are for explaining skills proficiency.

DATA AND METHODS

We analyse secondary data of the Programme for of the International Assessment of Adults' Competencies, a survey commissioned by the Organisation for Economic Co-operation and Development (OECD). In building the models, an individual's life course is approximated, i.e. the model starts with a block of demographic and then adds home background variables, education, current employment and occupation, on the job training activities and on the job skill use. The independent variables in the models are all binary categorical variables, with the value 1 for membership of the relevant category and 0 for non-membership. This means that the regression coefficients for all the variables are on the same scale and can be directly compared. These variables are not all completely independent of each other; rather there is high correlation between some of the variables. For instance, respondents' level of education tends to be similar to their parents' level of education. For this reason, a possible further research of the present paper could be to use a structural equation model in order to model those interaction effects.

The data were collected in 2011-12 and full results were available in October 2013. The domains tested were literacy, numeracy, and problem solving in technology rich environments. Previous international surveys comparable to PIAAC were the International Adult Literacy Survey (IALS) (1994-98) and the Adult Literacy and Lifeskills (ALL) Survey (2004-06). All these programmes aim to establish comparability and quality of education as a social outcome. PIAAC collected data for 24 OECD members, including Russia and Cyprus as OECD partners. It observes people across their entire work life and provides a substantially large sample size per country, allowing for rich analysis.

The standard survey mode was to answer questions on a computer, but for respondents without computer experience there was also the option of a pencil-and-paper interview. Countries used different sampling schemes in drawing their samples, but these were all aligned to known population counts with post-sampling weightings. Our analyses employ post-

[1] In the interest of brevity, only estimates for numeracy will be shown. However, results are consistent through the different domains analyzed and for this reason, I am referring throughout the text to both.

sampling weights in the estimations throughout. PIAAC combines household survey methodology with educational testing of competences on adult population skills (ages 16-65) and has a quite rich background questionnaire which includes socioeconomic status, education, training, labour market position, skills use, health and civic participation variables.

PIAAC uses about 100 questions for tests of basic knowledge and about 30 questions for more specific knowledge, which seems to be sufficient to limit the impact of differences in individual views within individual countries. The PIAAC framework and methodology used to generate plausible variables are against any attempt to interpret the results at the individual level and therefore the variables that measure adult skills are not the individual results of their tests. PIAAC adopts a "competence" approach e.g., asks whether people are able to implement their knowledge in different contexts. The concept of competence is defined as the ability to apply knowledge and skills in interactive situations related to different ability and involve understanding, reflection and judgment.

PIAAC measures each of the three skill domains on a 250-point scale and 50 point standard deviations. The score domains in PIAAC are less strongly correlated with an individual-level correlation between numeracy and literacy (problem-solving) of 0.85 (0.76). The proficiency in literacy is measured through 10 plausible values using Ralsch model (for details, see the technical report). Finally, our sample includes 107,178 individuals in 24 countries and sub-national units aged between 25 and 65 years. We exclude people aged between 16 and 24 because they are still earning their secondary education. We do not use data for Australia, Russia and Cyprus in our analysis. The Australian data are subjected to access restriction. According to the OECD (2013), data for the Russian Federation is preliminary and is not representative of the entire Russian population because it doesn't include the population of the Moscow municipal area. We do not use data on Cyprus because at the time of writing it was not available to us.

The analysis uses Owen values in order to decompose the variance of each successive block and disentangle their impact on skills. The estimations are performed using rego package in STATA. Moreover a fixed effects model is estimated, specifically, the literacy and numeracy score for a respondent i in country j is predicted as follows:

$(Skills)_{ij}=\beta_{0j}+\beta_{1j}$(post-sec edu)+ β_{2j} (tertiary edu)+β_{3j} (post-sec parental edu)+β_{4j} (tertiary parental edu)+$\sum \beta_{kj} X_{kij+}r_{ij}$

Estimates were produced with STATA 13 which is able to run multiple imputation methods. The estimated values will be replicated 80 times by the corresponding number of weights calculated in the survey and after being normalized by the actual sample of each country. The package used was repest but also piaacreg and pv were used for sensitivity controls.

Measurement

Dependent variables are derived from the PIAAC measurement of competence in numeracy and literacy skills. Numeracy is defined as "the ability to access, use, interpret and communicate mathematical information and ideas in order to engage in and manage the mathematical demands of a range of situations in adult life." The test has 56 items that

together measure how well respondents can use mathematical information to solve real-life problems (OECD 2013). To reduce the total time-on-test, respondents were given only a selection of the items. Item response techniques were then used to compute 10 plausible values for numeracy. Our independent variables are listed in five successive blocks:

1) Demographic variable: 1) age (discrete, 8 categories); 2) gender (dummy)
2) Parental background: 1) nativelang (dummy); 2) for_born (dummy) foreign born; 3) pared_2 (dummy) parental education post secondary; 4) pared_3 (dummy) parental education tertiary; 5) books (discrete)
3) Education: level of education attained two dummy variable for post-secondary and tertiary education
4) Labour market position: empl_dummy (others vs. employed); 2) long_unempl (others vs. more than 5 years unemployed); 3) skilled, white collar and blue_collar (dummies ref elementary occupation)
5) Train is a variable with five categories recoded from 5 likert scale variables. Those variables were transformed through factor analysis and then log rescaled. They represent successive training intensity on the job. Train_5 represent 80% or more of time on job dedicated to training.
6) Numwork and writwork are derived from 5 likert scales variables and log transformed. They represent intensity in use of numeracy and writing on the job.

RESULTS

PIAAC data allows the analysis of how the distribution of post-compulsory education affects the inequality of skills among young adults from a comparative perspective. As may be expected, highest education attainment is the variable that better explains the level of skills of adults (10%). However another important block of predictors in explaining skills is home background (10%). Overall, the model fit is high around 35% of the variance in literacy and numeracy proficiency is explained for OECD countries. There are six countries such as Flanders (Belgium), Sweden, Spain, United States, Canada (French) and Norway where the full model explains between 40 to 45% of the variance in literacy. On the other hand, Estonia, Czech Republic, Japan and Poland have a lower model fit (between 25 and 29%). Overall, the countries sampled in PIAAC seem to have a pretty similar way of structuring skills differences. Education is the most important predictor of literacy with 10% of variance explained followed by background (10%) and labour market and skills use at work blocks with a similar amount of variance explained (6 and 5%). It is still remarkable how skill use at work is relevant in explaining skills even after accounting for all the other variables.

The level of literacy skills is generally higher and less influenced by the variables included in the model. The model retains the almost similar coefficients and the corresponding sign. Important differences in the coefficients are noted by levels of education and position in the labour market. Numeracy seems to be more sensitive to the variables included in the model

compared to literacy. This could be related with the fact that literacy is a skill more commonly used than numeracy and the latter is a skill more intensively used by people that have higher educational attainment and a more specialized position in the labour market. Background variable model fit accounts for a third of the total variance in skills of the full model (Tables 1 and 2). In this block, parental education and books at home seems to have a strong impact on predicting literacy. Parental tertiary education has a strong impact in literacy respondents in the Slovak Republic, Germany, United States, United Kingdom and Korea. The most important effect is having tertiary academic education which represents, on average, 34 points advantage in literacy. Countries where this effect is very high are Germany, France, Flanders, and the United States.

Table 3 presents estimates of the skills gap by education attainment coded in three groups. The estimates are the result of a fixed effect model with country fixed effect and an interaction between country and the education attainment variable. The plausible values on numeracy allow for direct and unbiased estimation of differences in the numeracy proficiency of education attainment in various countries (OECD 2013b). As you might notice (Figure 3), the most important variation between countries are in basic secondary education attainment which is the level of basic skills achieved when mandatory education ends. There is a trade off in skill level between intermediate and university level education. The differentiation is made between low and highest level of education attainment.

The U.S., Canada, Germany and Spain are the countries where people with secondary education achieved lower skills within OECD countries; on the contrary Japan, Finland and Netherlands are the countries where people with secondary education achieved highest skills proficiency. This difference is 40 points between Japan and the U.S. Overall skill obtained with tertiary education is highest in Japan, but the gap between post-secondary education and tertiary is much higher in the U.S. and Belgium, Finland, Norway, France and Czech Republic. The Slovak Republic, Estonia and Italy have the lowest difference in skills by education attainment. In these countries there is little differentiation for the level of schooling obtained, moreover compared to the rest of OECD countries, they tend to have also lower level of skills proficiency. Generally, countries which have historically sought to raise the education attainment of the population have lower differentiation in skills gaps. They still maintain a certain rate of differentiation in skills by education level but this is moderate in comparison to the other countries, which is the case of Japan, Netherlands and Finland. On the other hand, countries such as the U.S., Canada, Belgium and Poland have higher differentiation by highest education level. Spain is on the average level of the rest of countries examined, but average level of skills obtained with secondary education tends to be lower and, numerically, Spain has the highest percentage in PIAAC countries with lowest education attainment.

In Figure 4, we plot the coefficient of average skills expected for an individual with tertiary education on the y axis and the coefficient of skills expected for an individual who has at least one parent with tertiary education completed. There is a high correlation (0.5) between those measures. Countries such as Italy, Estonia, Slovak Republic, Korea and Czech Republic have low parental skills gap and low differentiation between education attainments. On the contrary, French Canada and the U.S. have very high differentiation in skills in both dimensions analysed.

Countries such as Finland, England, Norway, Denmark and Austria have higher differences in skills by parental education, but moderate levels of education attainment gap in skills. English Canada, Poland and the Netherlands are countries with high education attainment gap and low parental differentiation in skills.

CONCLUSION

Results remain generally comparable, but future research and improved data collection might aim to progress on this point. Understanding how skills disparities between different levels of education attainment and home background are highly important. Findings from studies on achievement gaps in the U.S. and Canada suggest that ethnic and racial wage disparities can be attributed largely to differences in observed skills. Robust income differences are also observable in most Western countries, and it is highly plausible that reducing the skills gap is necessary (albeit perhaps not sufficient) for reducing such wage inequalities. This importance notwithstanding, the poor availability of cross-national data with direct measures of skills disparities has long hampered our understanding of the reasons behind observed skills disparities.

The paper is based on data collected by the Survey of Adult Skills 2012, a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC) that measures proficiency in literacy and numeracy internationally. In this contribution, we empirically tested how observed skills disparities between adults are related to individual and parental education attainment. We used cross-national assessment data with direct measurements of numeracy and literacy skills from almost 108,000 adults aged 25-65. The results show that even after accounting for all factors, education remains the most important predictor of literacy and numeracy proficiency among adults. In all countries, however, the total effect of education on skills is partially explained by the unequal distribution of education among individuals from different socioeconomic backgrounds. There is a strong and positive correlation between individual and parental tertiary education attainment. Gaps in skills by education level are generally higher between secondary and tertiary.

Table 1: General model for OECD, Numeracy

Gr	Regressor	Coef.		Std.Err.	P>|t|	Ind. R2	Group R2
1	gender	- 11,87	***	0,29	-	0,01	0,02
	age	- 1,31	***	0,06	-	0,01	
2	nativelang	- 13,57	***	0,60	-	0,01	0,10
	for_born	- 15,98	***	0,57	-	0,01	
	pared_2	4,30	***	0,32	-	0,01	
	pared_3	7,18	***	0,41	-	0,02	
	books	6,44	***	0,11	-	0,05	
3	educ_2	23,97	***	0,42	-	0,02	0,10
	educ_3	39,53	***	0,47	-	0,08	
4	empl_dummy	2,02	***	0,44	-	0,01	0,06

Gr	Regressor	Coef.		Std.Err.	P>|t|	Ind. R2	Group R2
	long_unempl	3,18	***	0,75	-	0,01	
	skilled	19,71	***	0,64	-	0,04	
	white_collar	10,05	***	0,62	-	0,00	
	blue_collar	7,53	***	0,64	-	0,00	
5	train_2	1,26		0,86	0,14	0,00	0,02
	train_3	- 0,64		0,96	0,51	0,00	
	train_4	4,31	***	0,66	-	0,00	
	train_5	2,59	***	0,34	-	0,01	
6	num_work	1,56	***	0,13	-	0,03	0,05
	writ_work	1,16	***	0,11	-	0,02	
-	Intercept	212,60		0,77	-		

*Overall R2 0.3592; Observations 107.178

Table 2: General model for OECD, Literacy

Gr	Regressor	Coef.		Std.Err.	P>|t|	Ind. R2	Group R2
1	gender	-2,563415	***	0,26	-	0,00	0,0202
	age	-2,1478	***	0,06	-	0,02	
2	nativelang	-14,20866	***	0,56	-	0,02	0,1087
	for_born	-17,10901	***	0,52	-	0,02	
	pared_2	4,140346	***	0,30	-	0,01	
	pared_3	7,978209	***	0,37	-	0,02	
	books	5,214676	***	0,10	-	0,05	
3	educ_2	20,48801	***	0,38	-	0,02	0,1003
	educ_3	35,77049	***	0,43	-	0,08	
4	empl_dummy	-0,047766		0,40	0,91	0,01	0,0561
	long_unempl	4,019832	***	0,68	-	0,01	
	skilled	16,09749	***	0,58	-	0,03	
	white_collar	8,844522	***	0,57	-	0,00	
	blue_collar	4,099154	***	0,59	-	0,01	
5	train_2	2,330021	***	0,79	0,00	0,00	0,0189
	train_3	0,517924		0,88	0,56	0,00	
	train_4	7,242693	***	0,61	-	0,00	
	train_5	3,460437	***	0,31	-	0,01	
6	num_work	0,975124	***	0,12	-	0,02	0,0452
	writ_work	1,406812	***	0,10	-	0,021	
-	Intercept	225,8316		0,71	-		

*Overall R2 0.34937; Observations 107.178

Figure 1: Variance of numeracy explained by blocks, Owen values, PIAAC 2012

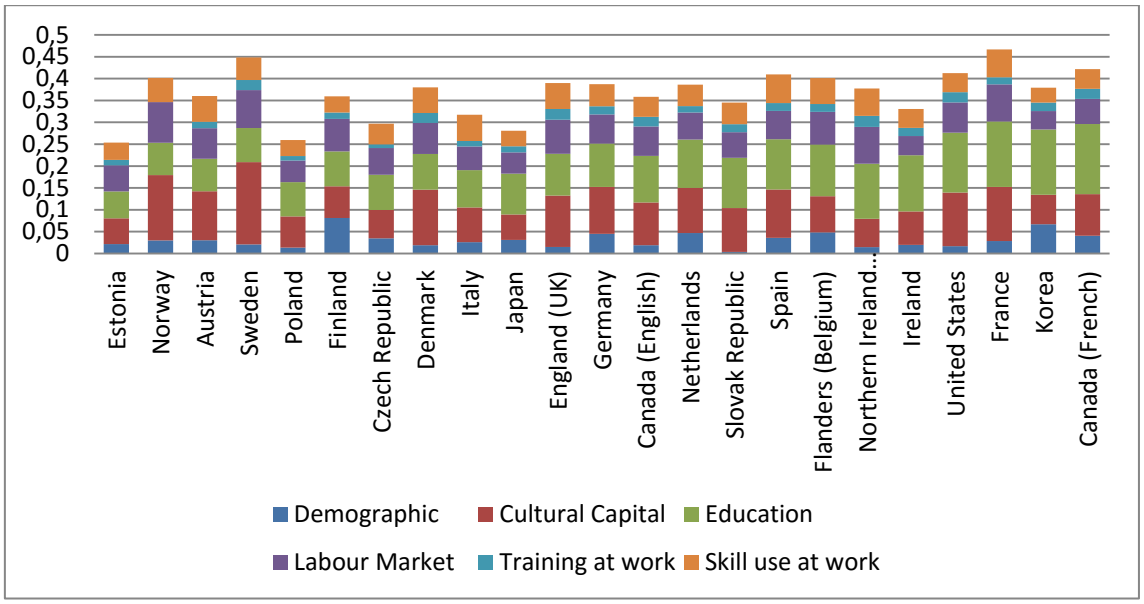
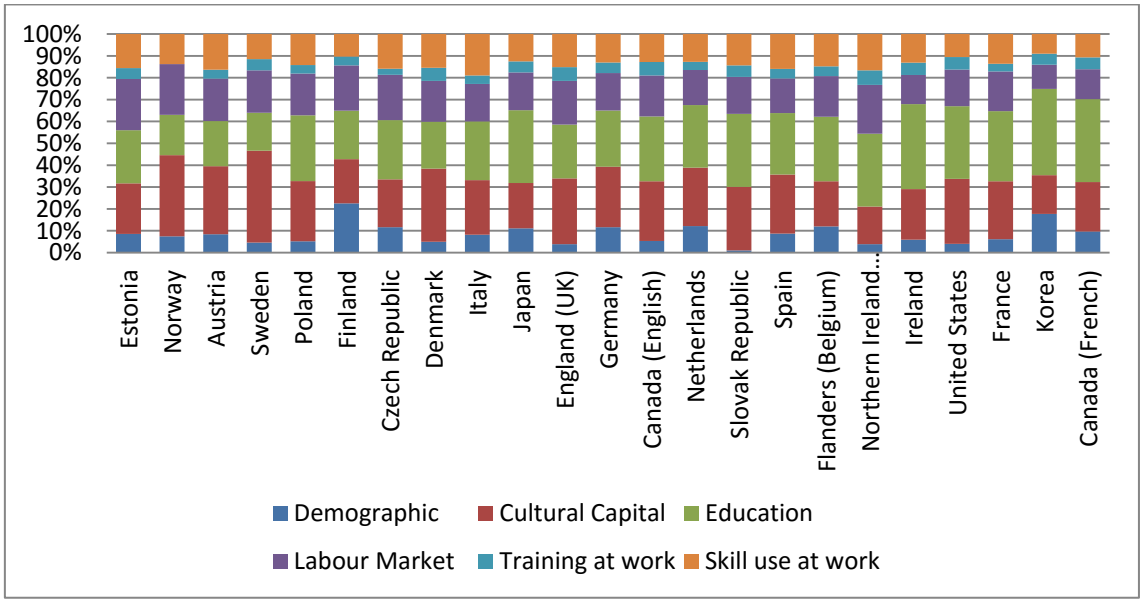


Figure 2: % of total variance of numeracy skills explained by successive block of predictors, sorted by education, Owen Values



Source: PIAAC 2013, Own calculation. The height of the histograms represents the % of total variance explained by each successive block of predictors

Table 2: Full Model

		Austria	Belgium (Flanders)	Canada (English)	Canada (French)	Czech Republic	Denmark	Estonia	Finland	France	Germany	Ireland	Italy
Gender	Coef.	-9.32***	-15.82***	-16.36***	-15.33***	-10.73***	-13.59***	-11.26***	-14.68***	-10.83***	-15.13***	-12.58***	-9.01***
	S.E.	1,54	1,79	1,55	1,55	2,41	1,8	1,33	1,8	1,41	1,82	1,77	1,83
Age	Coef.	-2.34***	-2.78***	-0.72**	-2.92***	-2.14***	-2.29***	-1.32***	-4.63***	-1.61***	-3.29***	-0.37	-1.68***
	S.E.	0,35	0,42	0,36	0,38	0,5	0,31	0,38	0,35	0,33	0,4	0,41	0,41
Native language	Coef.	-24.51***	-20.25***	-5.13**	-10.37**	11.91	-20.28***	2.66	-36.88***	-13.49***	-13.27***	-16.41***	-9.1**
	S.E.	4,52	4,49	2,28	4,08	12,61	4,93	3,36	6,54	3,12	4,52	4,25	4,55
Foreing born	Coef.	-8.45**	-17.12***	-19.63***	-19.6***	-13.53	-15.9***	-7.61***	-4.9	-23.64***	-12.36***	-1.92	-4.77
	S.E.	4,07	3,75	1,92	3,87	11,35	4,86	1,78	6,74	2,41	4,42	2,7	4,57
Post-secondary parental education	Coef.	1.28	4.07**	2.88	6.11***	5.57	0.6	-0.84	1.82	3.97***	7.33**	4.01*	2.22
	S.E.	2,37	1,91	1,91	1,71	3,95	1,87	1,6	1,43	1,52	3,62	2,1	2,33
Tertiary parental education	Coef.	1.69	7.56***	8.45***	12.6***	6.02	5.42**	3.11	8.52***	8.19***	10.9***	7.73***	-4.17
	S.E.	3,04	2,24	2,32	2,29	5,11	2,19	1,9	2,69	2,37	3,84	2,54	4,1
Books at home	Coef.	6.15***	3.24***	6.08***	4.63***	6.59***	5.15***	5.55***	4.44***	4.91***	5.6***	5.86***	7.2***
	S.E.	0,75	0,6	0,67	0,75	1,25	0,48	0,56	0,64	0,49	0,74	0,65	0,77
Post-secondary education	Coef.	14.74***	20.71***	29.42***	35.86***	16.07***	17.86***	18.99***	8.77***	24.42***	26.62***	25.85***	21.83***
	S.E.	2,45	2,22	3,29	2,85	4,45	2,69	2,09	3,02	1,91	4,13	2,34	1,83
Tertiary education	Coef.	31.88***	43.38***	48.91***	54.65***	39.64***	31.38***	31.09***	29.56***	49.04***	44.21***	44.48***	21.69***
	S.E.	3,02	2,76	3,28	3,09	5,24	2,48	2,34	3,31	2,23	4,31	2,61	3
Employed	Coef.	-2.25	-5.17*	0.61	0.35	-2.04	2.05	2.72	4.98*	-3.19	6.54**	-2.35	-0.4
	S.E.	2,98	2,89	2,57	3,01	4,52	2,33	2,25	2,77	2,15	2,94	2,81	3,49
Not employed for at least 5 years	Coef.	12.37**	7.07*	1.71	2.83	35.68**	-1.47	-5.48	3.24	4.83	-0.05	-8.01	2.32
	S.E.	5,1	3,94	4,53	4,55	15,9	4,33	3,97	4,4	3,37	5,09	4,94	4,29
Skilled	Coef.	21.37***	21.06***	27.98***	16.31***	24.24***	17.83***	16.11***	23.56***	24.75***	18.81***	8**	12.18***
	S.E.	3,54	3,6	3,7	3,64	4,74	3,35	2,71	3,57	2,76	4,15	3,63	4,33
White-collar	Coef.	12.9***	16.81***	7.34*	8.27**	23.43***	11.13***	6.15**	10.84***	16.01***	8.95**	0.53	11.45***
	S.E.	3,35	3,42	3,82	3,75	4,94	3,21	2,74	3,51	2,67	3,89	3,63	3,56
Blue-collar	Coef.	8.67**	12.83***	9.82***	3.04	12.2**	4.02	0.91	8.29**	9.37***	1.48	2.51	6.69*
	S.E.	3,6	3,4	3,41	3,82	5,33	3,42	2,66	3,77	2,79	3,84	3,67	3,88
Train_2	Coef.	-2.11	2.45	9.8**	3.87	-5.81	-3.16	1.83	4.86	6.66	2.88	2.15	-0.6
	S.E.	5,4	5,11	3,96	5,05	6,97	6,03	3,45	4,41	8,09	4,95	5,73	7,02
Train_3	Coef.	1.99	-14.76***	3.14	-0.79	13.96***	1.95	-4.71	0.01	21.59***	0.08	-5.12	1.96
	S.E.	6,21	5,35	5,93	7,65	5,33	6,4	4,07	5,35	7,44	8,44	6,39	8,43
Train_4	Coef.	3.13	0.31	8.24**	8.49	1.27	5.26*	4.93	4.03	4.19	9.66*	12.95***	6.78
	S.E.	3,82	3,46	3,24	5,39	3,55	2,89	4,02	3,23	6,51	5,31	4,76	9,62
Train_5	Coef.	1.32	2.6	2.79	5.07**	5.39**	2.03	-0.07	0.89	2.37	0.76	4.46**	3.08
	S.E.	2,39	2,19	1,87	2,18	2,49	1,71	1,56	1,75	1,58	2	2,24	3,16
Numeracy at work	Coef.	2.64***	1.99**	0.72	1.76**	0.41	3.95***	-0.06	1.09	1.97***	1.97***	2.52***	2.14**
	S.E.	0,68	0,78	0,7	0,76	1,05	0,75	0,64	0,73	0,68	0,75	0,83	0,94
Writing at work	Coef.	1.56**	1.45**	1.54**	0.15	1.09	-0.46	1.46**	-0.33	1.5**	0.27	-0.05	2.47**
	S.E.	0,65	0,72	0,65	0,62	0,9	0,56	0,68	0,7	0,6	0,66	0,76	1,03
Cons	Coef.	234.82***	244.24***	198.96***	211.49***	219.07***	235.38***	228.87***	256.22***	208.51***	218.56***	214.85***	216.58***
	S.E.	5,02	4,2	5,28	5,33	8,8	4,51	4,61	5,21	4,25	6,14	4,88	4,66
R2 adj		0,36	0,4	0,36	0,42	0,32	0,35	0,26	0,36	0,46	0,4	0,32	0,3

Source: PIAAC 2013, Own calculation (* p<.01, ** p<.05, *** p<0.01)

Table 2: Full Model (continued)

		Japan	Korea	Netherlands	Norway	Poland	Slovak Republic	Spain	Sweden	United States	England (UK)	Northern Ireland (UK)	OECD Average
Gender	Coef.	-8.34***	-7.43***	-14.69***	-14.66***	-5.2***	-0.62	-12.32***	-14.57***	-14.84***	-14.52***	-11.35***	-14.56***
	S.E.	2,02	1,53	1,42	2,71	1,81	1,47	1,54	1,87	1,79	2,14	2,5	3,51
Age	Coef.	-2.07***	-2.96***	-2.47***	-1.79***	-0.53	0.54	-2.74***	-1.51***	-0.84***	-0.03	-0.16	-1.45
	S.E.	0,37	0,37	0,37	0,53	0,39	0,36	0,38	0,4	0,31	0,43	0,54	0,98
Native language	Coef.	1.7	-7.9	-17.86***	-40.14***	-11.13	-11.89***	-7.85**	-19.84***	-8.84**	-17.07***	-21.71***	-12.31*
	S.E.	26,55	9,63	5,37	8,22	8,65	2,93	3,42	4,03	3,81	5,14	8,3	6,99
Foreing born	Coef.	-37.44*	-25.81***	-23.1***	-7.33	-40.73***	3.27	-15.88***	-25.72***	-8.4**	-19.18***	-11***	-15.86***
	S.E.	19,2	7,33	4,44	8,56	11,02	3,81	2,5	4,07	3,63	4,37	4,22	2,98
Post-secondary parental education	Coef.	0.38	0.38	1.88	7.65***	3.14	10.87***	-0.42	3.65	14.04***	9.27***	4.03*	-1.85
	S.E.	1,98	1,67	1,84	2,76	2,35	1,77	2,01	2,26	2,83	2,43	2,35	6,88
Tertiary parental education	Coef.	2.69	4.59**	2.01	6.51**	6.31	10.73***	2.54	3.95*	18.99***	14.51***	8.64**	2.89
	S.E.	2,49	1,96	2,12	3,18	3,85	3,23	2,57	2,25	3,27	3,01	3,54	7,8
Books at home	Coef.	5.13***	4.35***	5.26***	6.5***	6.17***	6.37***	7.01***	5.97***	6.78***	7.25***	4.72***	7.06***
	S.E.	0,65	0,51	0,55	0,95	0,77	0,77	0,67	0,75	0,72	0,77	0,83	2,62
Post-secondary education	Coef.	24.16***	27.09***	20.25***	14.26***	20.84***	28.15***	22.02***	17.35***	28.2***	21.12***	23.73***	17.67**
	S.E.	3,11	2,33	2,38	3,14	3,25	2,71	2,2	2,99	3,28	2,76	2,79	8,71
Tertiary education	Coef.	37.87***	43.35***	37.46***	30.56***	37.88***	40.17***	32.15***	35.38***	54.34***	30.79***	38.72***	35.39*
	S.E.	3,3	2,35	2,45	3,76	3,95	3,59	2,15	2,89	4,24	2,82	2,96	18,37
Employed	Coef.	-4.05	-1.69	1.86	2.91	-0.92	1.43	4.43**	2.83	3.77	1.66	-2.84	-1.42
	S.E.	3,21	2,38	2,82	3,77	2,98	2,13	1,9	3,24	2,51	3,21	3,59	5,04
Not employed for at least 5 years	Coef.	9.16*	8.21**	15.25***	-3.6	-1.39	-5.27	3.45	-9.12	5.29	4.25	-8.86*	3.61
	S.E.	5,04	3,31	4,98	7,29	4,55	3,97	3,39	6,58	5,53	4,56	4,68	17,98
Skilled	Coef.	16.78***	14.17***	24.6***	28.21***	15.05***	8.83**	11.98***	22.21***	23.77***	28.52***	15.65***	21.23*
	S.E.	4,11	2,78	4,19	6,79	4,46	3,9	2,9	5,4	4,19	4,46	5,29	11,8
White-collar	Coef.	7.39**	7.3***	19.77***	10.64*	4.94	6.45*	7.26***	10.27**	11.91***	15.53***	6.28	14.9
	S.E.	3,45	2,58	4,11	6,24	4,2	3,55	2,29	5,1	4,22	4,16	4,42	23,05
Blue-collar	Coef.	6.17	5.24*	13.84***	11.82*	2.96	7.03**	4.65*	8.79*	8.37**	12.55***	0.9	0.57
	S.E.	3,91	2,8	4,09	6,79	4,15	3,27	2,75	4,99	4,26	4,06	5,44	22,15
Train_2	Coef.	-6.92	-2.62	8.18**	-	3.42	-4.78	0.2	4.85	10.81*	11.25*	8.3	7.29
	S.E.	5,42	3,09	3,94	-	6,02	8,06	4,02	4,72	5,57	6,25	7,31	8,87
Train_3	Coef.	-5.04	2.89	-3.07	-	-12.88*	6.68	4.46	6.43	-7.88	13.7*	18.57**	1.8
	S.E.	6,09	2,59	4,39	-	6,79	6,18	4,52	5,26	6,44	8,09	8,15	1,24
Train_4	Coef.	-1.71	8.15***	-0.68	-	5.6	8.41	-1.43	15.24***	2.61	7.28	-0.95	4.57
	S.E.	4,19	2,49	2,96	-	5,94	5,29	4,5	3,58	3,31	6,05	7,64	4,39
Train_5	Coef.	3.74*	5.39**	0.06	-	-2.8	9.12***	2.74	1.21	4.1*	2.13	3.87	4
	S.E.	1,95	2,12	1,72	-	2,78	2,53	2,04	1,94	2,17	2,57	3,16	3,02
Numeracy at work	Coef.	1.1*	-0.35	1.35*	1.72	1.82**	2.29***	2***	1.79*	0.91	2.05*	3.09***	1.58
	S.E.	0,66	0,58	0,78	1,05	0,8	0,71	0,58	0,93	0,79	1,14	0,99	2,25
Writing at work	Coef.	1.76***	1.65***	0.88	1.78*	1.43**	-0.17	1.06**	0.82	1.07	0.79	-0.21	0.73
	S.E.	0,58	0,49	0,73	1,07	0,64	0,69	0,54	0,8	0,77	0,93	0,95	1,55
Cons	Coef.	243.68***	222.56***	236.28***	223.92***	208.71***	210.56***	213.93***	232.33***	174.77***	200.37***	219.45***	222.36***
	S.E.	5,83	3,97	4,84	8,4	5,47	4,91	3,1	6,01	5,75	4,95	7,13	21,07
R2 adj		0,28	0,38	0,42	0,42	0,26	0,34	0,39	0,44	0,42	0,38	0,39	0,38

Source: PIAAC 2013, Own calculation (* p<.01, ** p<.05, *** p<0.01)

Figure 3: Skill obtained by education achievement

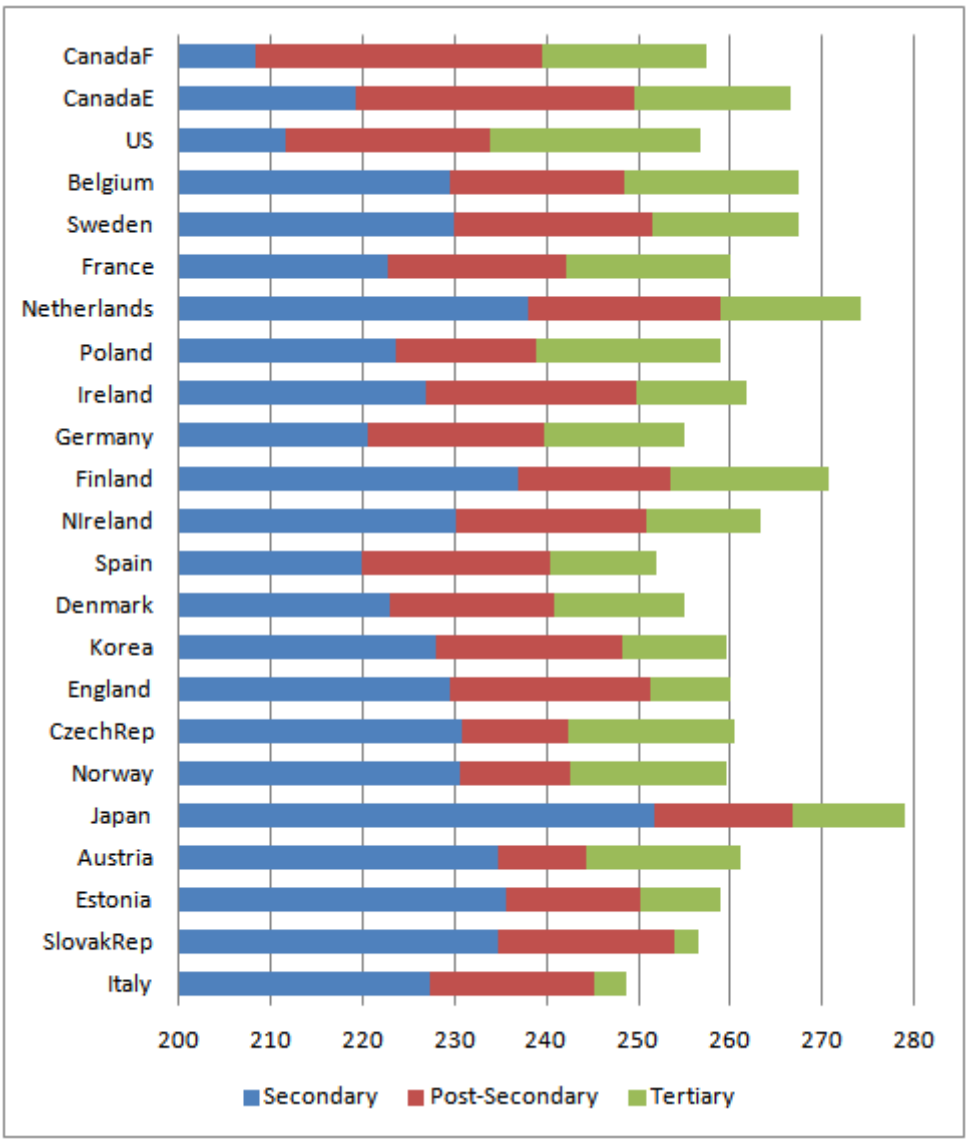
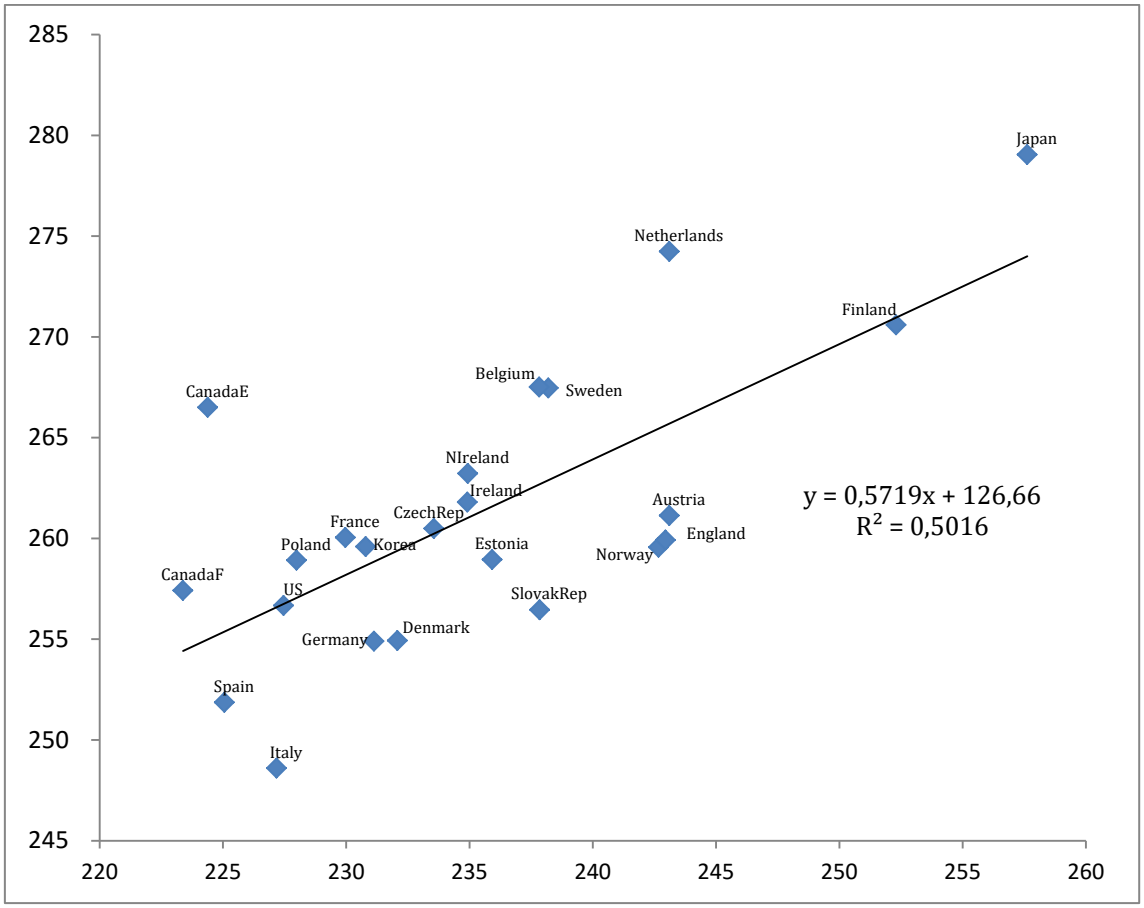


Figure 4: Relation between skills expected for an individual with tertiary education (y axis) and an individual who has at least one parent with tertiary education (x axis)



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