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How Closely is
the Distribution of Skills
Related to Countries'
Overall Level of Social
Inequality and Economic
Prosperity?

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**HOW CLOSELY IS THE DISTRIBUTION OF SKILLS RELATED TO COUNTRIES' OVERALL
LEVEL OF SOCIAL INEQUALITY AND ECONOMIC PROSPERITY?**

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Dirk Van Damme

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This working paper has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

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ABSTRACT

A country's level of human capital – the knowledge and skills in the population – has a strong bearing on its economic potential for growth and prosperity. On the other hand, its level of social inequality might prevent prosperity to be shared in equitable ways across the population. This paper looks at the relationship between the distribution of numeracy skills in the population to measures of economic prosperity (per capita GDP) and social inequality (Gini coefficient). Country-level correlations between various measures of the skills dispersion and these two indicators are presented. The correlations suggest that a higher numeracy skills dispersion is related to higher social inequality. A higher share of low-skilled adults relates positively with greater social inequality, while a higher share of high-skilled adults seems to be related with higher levels of economic output.

RÉSUMÉ

Le niveau du capital humain dans un pays - les connaissances et les compétences de la population - a une forte influence sur son potentiel de croissance économique et sa prospérité. D'autre part, son niveau d'inégalité sociale pourrait empêcher le partage équitable de la richesse entre tous les groupes de la population. Ce papier se penche sur la relation entre d'une part la répartition des compétences en numératie de la population, et d'autre part des mesures de prospérité économique (PIB par habitant) et d'inégalités sociales (coefficient de Gini). Les corrélations au niveau des pays entre les différentes mesures de la dispersion des compétences et ces deux indicateurs sont présentés. Ces corrélations suggèrent qu'une dispersion plus élevée des compétences en numératie est liée à un niveau d'inégalité sociale plus élevé. Une proportion plus élevée d'adultes peu qualifiés est associée positivement à une plus grande inégalité sociale, tandis qu'un pourcentage plus important d'adultes hautement qualifiés semble être lié à des niveaux plus élevés de production économique.

HOW CLOSELY IS THE DISTRIBUTION OF SKILLS RELATED TO COUNTRIES' OVERALL LEVEL OF SOCIAL INEQUALITY AND ECONOMIC PROSPERITY?

Dirk Van Damme¹

Skills distribution, social inequality and economic performance

Skills are critically important for the economic performance of countries. Greater proficiency in key skills among workers drive productivity and participation in the labour force, thus leading to increased growth and prosperity. In turn, higher economic output provides individuals, companies and the state with the resources to improve the opportunities for acquiring and developing skills.

The aftermath of the economic crisis and rapidly rising levels of inequality (OECD, 2011) have raised concerns about inclusiveness of growth, and placed greater emphasis on models of economic and social development that combine growth with an equitable sharing of its benefits across the population. The concept of inclusive growth also suggests that less unequal societies are better able to mobilise skills and other social resources to foster economic growth. Inequalities in skills can result in overall social inequality, as less-skilled people find themselves deprived of many of the resources that secure participation in the labour market, in democratic institutions and in civic life.

Until recently, proficiency in skills was measured by educational attainment or years spent in education. The Survey of Adult Skills (PIAAC) (OECD, 2013) now provides direct measures for the proficiency of 16-65 year-olds in literacy, numeracy and problem-solving. These data allow for an examination of the relationship between skills, economic performance and social inequality in greater detail and with greater validity. This paper concentrates on numeracy skills.²

Analyses of the relationship between skills and economic and social outcomes are mostly limited to comparing average skills proficiency among countries. This paper also focuses on the relationship between the distribution of numeracy skills and social inequality, on the one hand, and economic performance on the other. It is a two-way relationship. Greater income inequality is likely to lead to a wider spectrum of proficiency due to the fact that there is a greater variation in the resources that individuals and families can spend on education, and that more income inequality could motivate people to invest in upgrading their skills. At the same time, a wider range of proficiency is likely to lead to greater income inequality if workers are paid wages that reflect their productivity, which, in turn, is partially determined by their skills proficiency. At the aggregate level, higher national income is likely to lead to higher average proficiency given that the resources that society (the state, individuals, families and enterprises) can devote to education and training are greater. At the same time, higher average proficiency is likely to lead to higher productivity.

The policy relevance of these relationships is clear: it is important for countries to know in which segment of the skills distribution they should invest in order to achieve greater economic output or a more equal distribution of income. Should countries invest in skills policies that favour the highly skilled, at the risk of increasing the gap between low- and high-skilled workers? Or should they try to keep the skills gap as small as possible? It is also important to have a good understanding of the trade-offs between economic performance and social equality as they relate to skills policies.

This paper explores the country-level relationships between various measures of the distribution of skills among adults using data from the Survey of Adult Skills, and overall social inequality, as measured by the Gini coefficient³ on the one hand and overall economic output as measured by GDP per capita⁴ on the other. The analysis does not provide evidence of the causal nature of the relationships.

Table 1 provides an overview of the country-level correlations between various measures of the distribution of numeracy skills with both the Gini coefficient of income inequality and per capita GDP. The most powerful correlations (≥ 40) are highlighted.

Table 1. Overview of country-level correlations between various measures of numeracy proficiency and the Gini coefficient and GDP per capita

	Gini	per capita GDP
Mean score	-.63	.11
Percentage of adults scoring at or below Level 2	.59	-.20
Percentage of adults scoring at Level 4 or 5	-.54	.36
Score-point difference 90 th minus 10 th percentile	.35	.61
Score- point difference 75 th minus 25 th percentile	.40	.59
Score-point difference 16-24 year-olds minus 55-64 year-olds	-.01	-.36
Score-point difference between adults with tertiary and lower than upper secondary education	.17	.43
Score-point difference 75 th minus 25 th percentile among adults with lower than upper secondary education	.19	.38
Score-point difference 75 th minus 25 th percentile among adults with upper secondary education	.30	.53
Score-point difference 75 th minus 25 th percentile among adults with tertiary-type A education	.36	.32
Score-point difference between adults with at least one parent who attained tertiary education and adults with neither parent who attained upper secondary education	.19	.25

Main findings and policy relevance

The main findings of the following exploratory analysis include:

Countries with higher mean proficiency in numeracy, fewer low-skilled adults and more high-skilled adults tend to enjoy more social equality. A greater share of highly skilled adults is also positively, albeit weakly, related to economic performance.

Skills policies that improve the mean numeracy performance among adults are associated with higher levels of social equality. Reducing the number of low-skilled workers and increasing the number of high-skilled adults is related to social equality and, to a small extent, economic performance.

A wide distribution of numeracy skills is related to greater social inequality, but also to greater economic performance.

Skills policies that result in a wide gap between low- and high-skilled workers seem to be related to greater overall inequality. However, they also seem to be related to greater productivity and economic output.

Skills inequality between age groups is unrelated to overall social inequality.

Skills policies that foster the improvement of skills among younger adults, and thus widen the gap in skills between younger and older generations, do not seem to be negatively related to overall social inequality.

A wider skills gap between high- and low-educated adults is moderately linked to economic performance, but is unrelated to social inequality.

Skills policies that improve the proficiency of tertiary-educated adults, and thus widen the gap between them and low-educated adults, do not seem to be related to overall social equality.

A wider distribution of skills proficiency among low-educated adults is unrelated to social inequality, but among moderately educated adults it is positively associated with economic prosperity.

Skills policies that provide opportunities for low-educated adults to improve their proficiency to a level above the mean predicted by their educational attainment, and which thus widens the skills gap among low-educated adults, seem unrelated to social equality. Improving the skills of moderately educated adults seems to be positively related to economic performance.

Greater inequality in skills proficiency related to parents' educational background is only weakly related to overall social inequality.

Obviously, countries should not develop skills policies that favour adults who already benefit from a background of socio-economic advantage and high educational attainment. In all countries, adults from higher-educated families have greater skills proficiency. But the magnitude of the skills gap related to social background seems to be only weakly related to countries' overall level of social inequality.

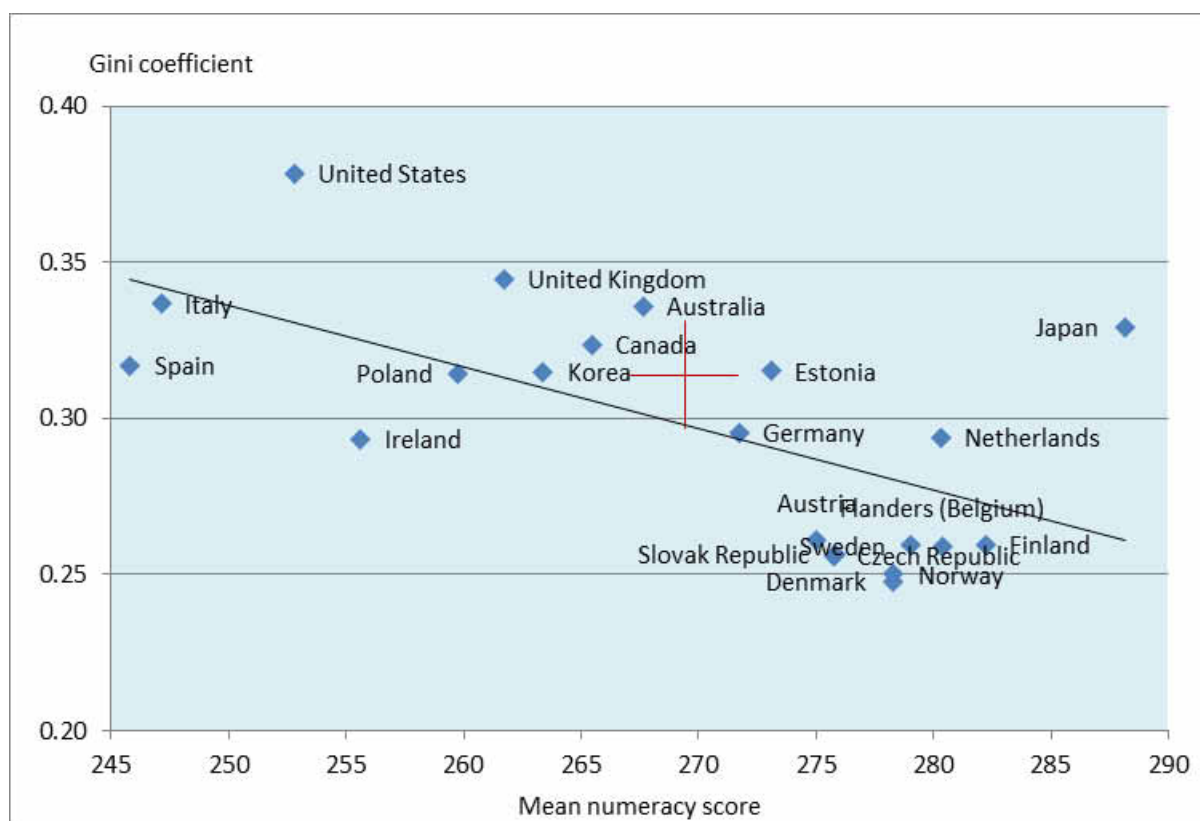
Taken together, these preliminary findings seem to suggest that the best skills policies are those that improve skills proficiency across all adults, reduce the number of low-skilled adults, and increase the number of high-skilled adults. Widening the skills gap between low- and high-skilled adults might be harmful for social equality to some extent, but not when it provides opportunities for low- and moderately educated people to improve their skills to a level above that associated with their educational attainment. It is indeed possible to design skills policies that contribute to inclusive growth, integrating economic performance with social equity.

Countries with higher mean proficiency in numeracy, fewer low-skilled adults and more high-skilled adults tend to enjoy more social equality. A greater share of highly skilled adults is also positively, albeit weakly, related to economic performance.

Countries with greater social equality tend to have more numerate adult populations. Austria, the Czech Republic, Flanders (Belgium), the Nordic countries and the Slovak Republic have relatively high mean numeracy scores and also have relatively modest income inequality. By contrast, Ireland, Italy, Poland, Spain, the United Kingdom and the United States have relatively low mean numeracy scores and

have greater income inequality. The correlation (-.63) between income inequality and the mean score in numeracy is strong. The correlation remains strong across age groups, and weakens only slightly, to -.49, among 55-65 year-olds.

Figure 1. Relationship between the mean numeracy score and the Gini coefficient



In contrast, mean numeracy scores have only a weak relationship (.11) with countries' overall economic performance, as measured by GDP per capita. Among 35-44 year-olds the country-level correlation between the mean numeracy score and GDP per capita rises to .22, which is still weak.

Countries with greater income inequality tend to have more low-skilled adults and fewer high-skilled adults. The correlation between income inequality and the proportion of low-skilled adults is .59, while that between income inequality and the proportion of high-skilled adults is -.54. Countries that enjoy greater social equality, such as the Nordic countries and Flanders (Belgium) generally have fewer low-skilled and more high-skilled adults.

Figure 2. Relationship between the percentage of adults with low proficiency in numeracy and the Gini coefficient

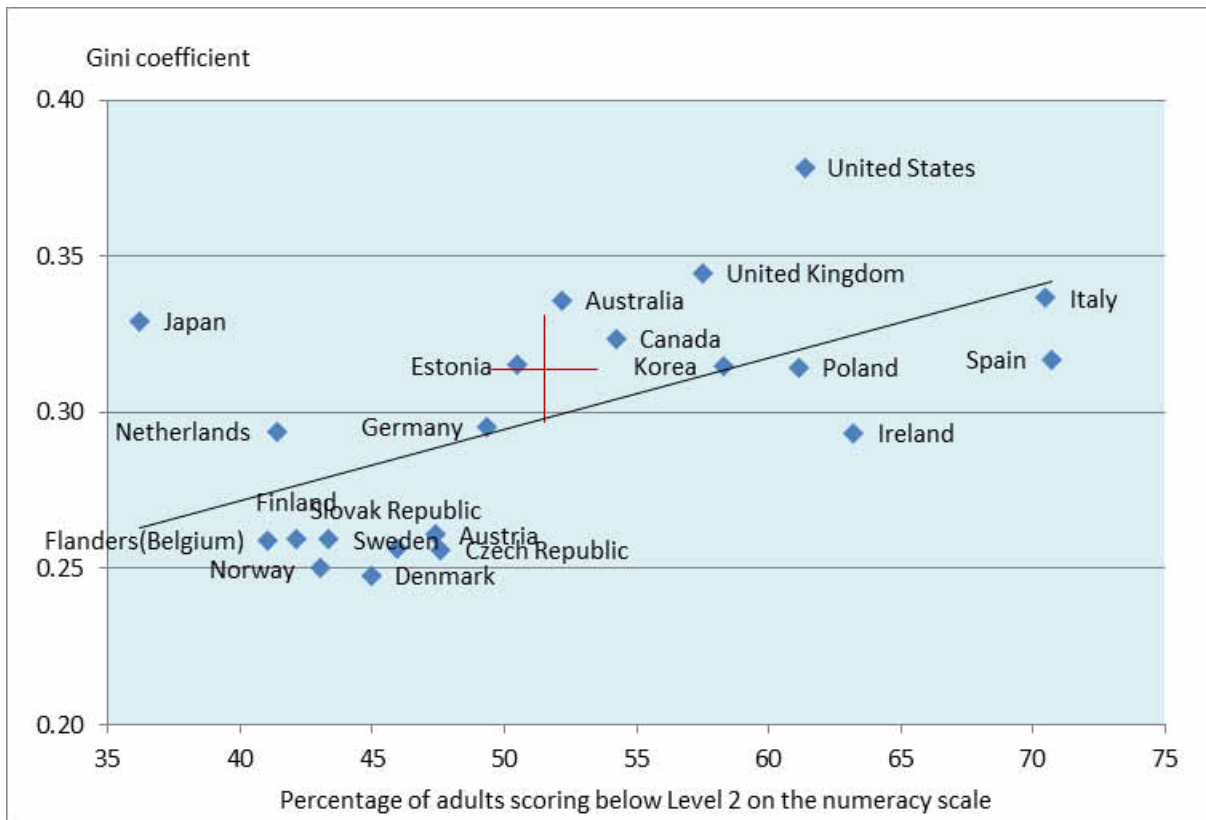
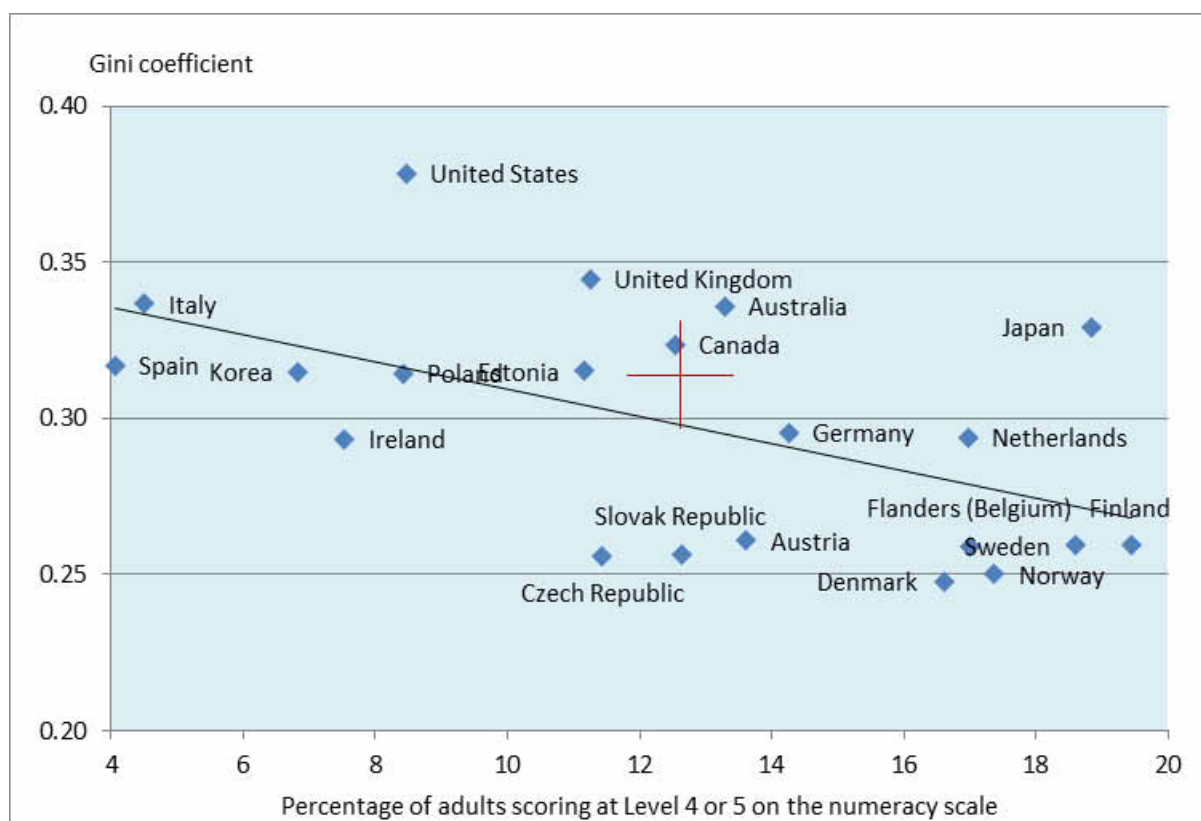


Figure 3. Relationship between the percentage of adults with high proficiency in numeracy and the Gini coefficient



The relationships between the shares of low- and high-skilled workers and economic performance are much weaker, but a larger share of highly numerate adults is positively, albeit weakly (.36), associated with GDP per capita.

Thus, improving the numeracy skills in the general population seems to be positively associated with social equality and, particularly at the higher end of the proficiency scale, with economic performance. Higher-skilled adults provide the economy with better human capital, which leads to greater productivity. Policies that aim to reduce the number of adults with poor numeracy skills, as well as those that aim to increase the number of highly skilled adults help to reduce overall levels of social inequality.

A wide distribution of numeracy skills is related to greater social inequality, but also to greater economic performance.

The relative distance between two points on the numeracy scale gives a good indication of the level of inequality in the skills distribution. Comparing the two extreme deciles in the distribution (the 90th and 10th percentiles) or the two outermost quartiles (the 75th and 25th percentiles) gives similar results.

The Gini coefficient of overall social inequality is moderately related (country-level correlation of .40) to the score-point difference between the 75th and 25th percentiles on the numeracy scale. The correlation with the score-point difference between the 90th and 10th percentiles is slightly weaker (.35). A wider distribution of numeracy skills is thus somewhat related to greater social inequality, but only above a

certain threshold level of skills inequality. Among countries with a difference lower than 70 score points between the 75th and 25th percentiles on the numeracy scale there is no relation between the skills gap and social equality. As **Error! Reference source not found.** illustrates, next to the United States, the United Kingdom, Australia and Canada share a wide skills distribution and a high Gini coefficient. The Nordic countries and Flanders (Belgium) have average to high inequality in numeracy skills but do not have a high Gini coefficient.

At the same time, per capita GDP is more strongly related (.59) to the score-point difference between the 75th and 25th percentiles (.61 with the score-point difference between the 90th and 10th percentiles). The former relationship is important. Australia, Canada, Germany, the United Kingdom and the United States show both wide gaps in skills proficiency among adults and relatively high GDP per capita. By contrast, Flanders (Belgium), Ireland, the Netherlands and the Nordic countries achieve similar levels of economic performance with more evenly distributed skills proficiency among adults.

Figure 4. Relationship between the distribution of numeracy proficiency among adults and the Gini coefficient

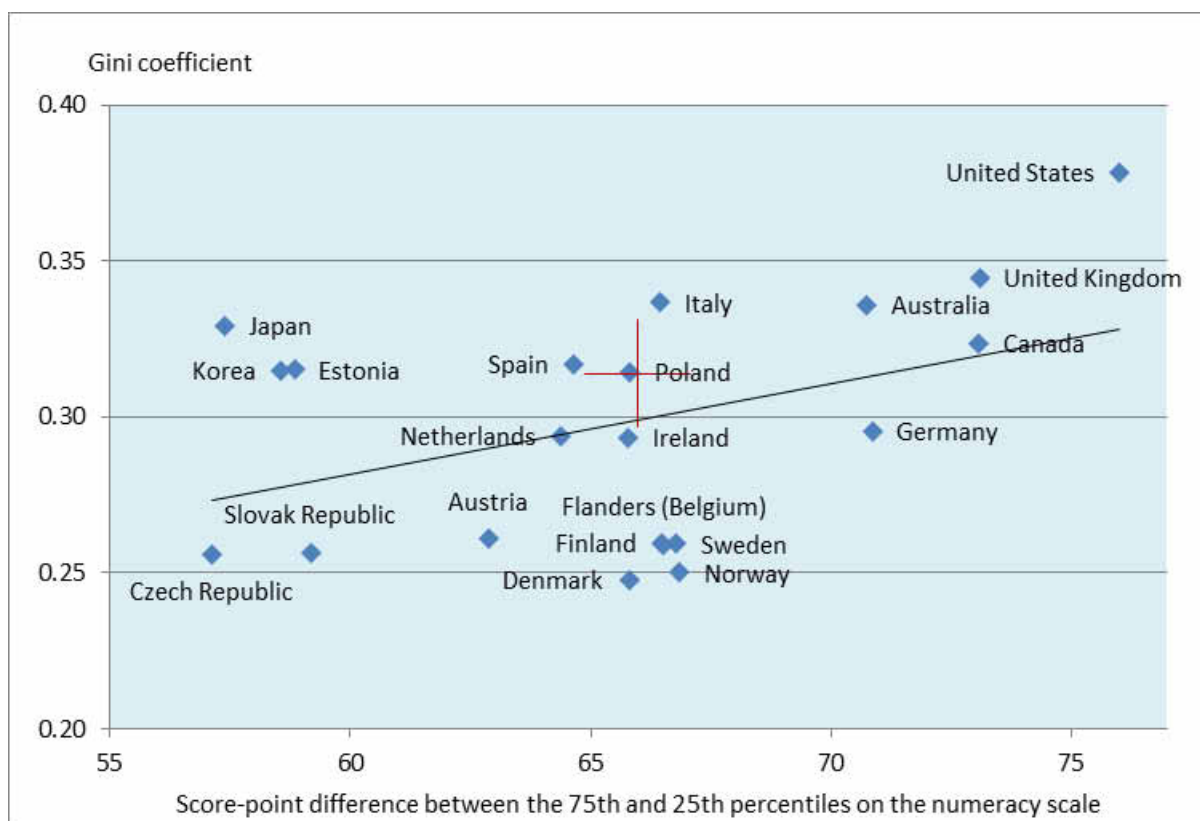
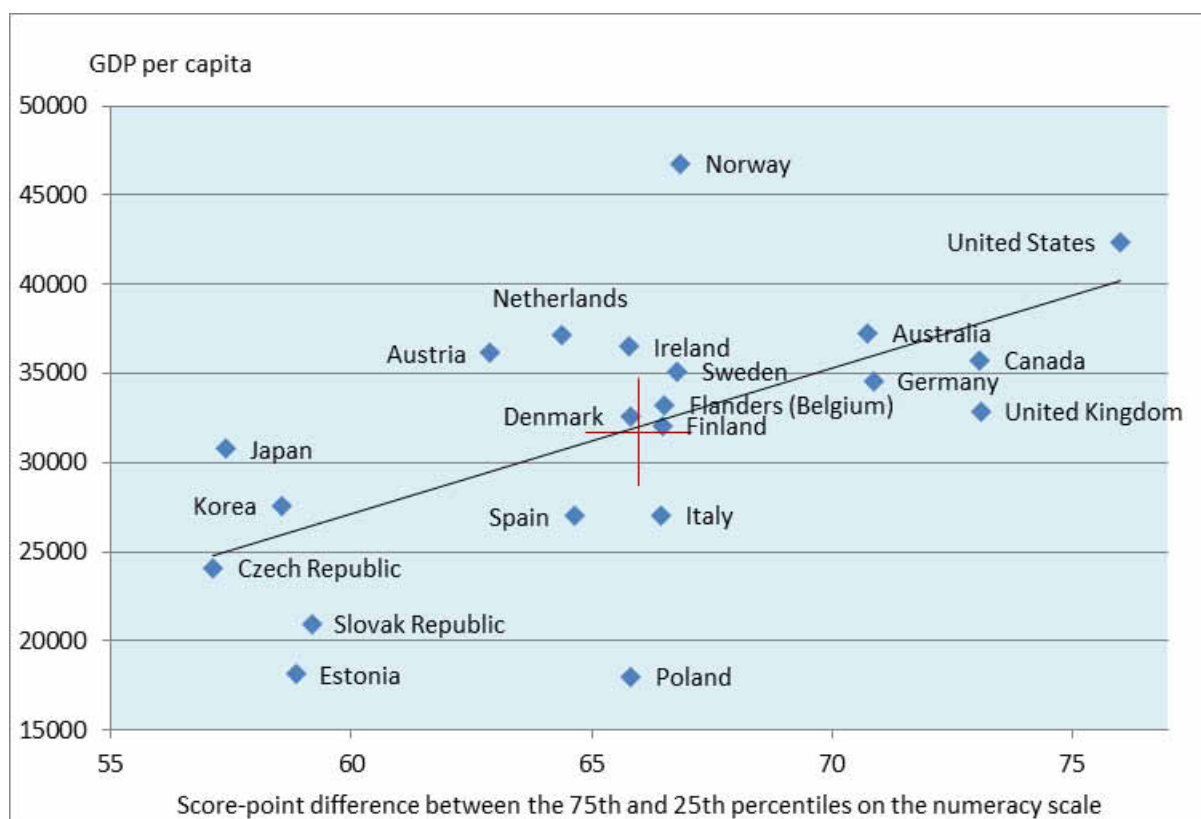


Figure 5. Relationship between the distribution of numeracy proficiency and GDP per capita

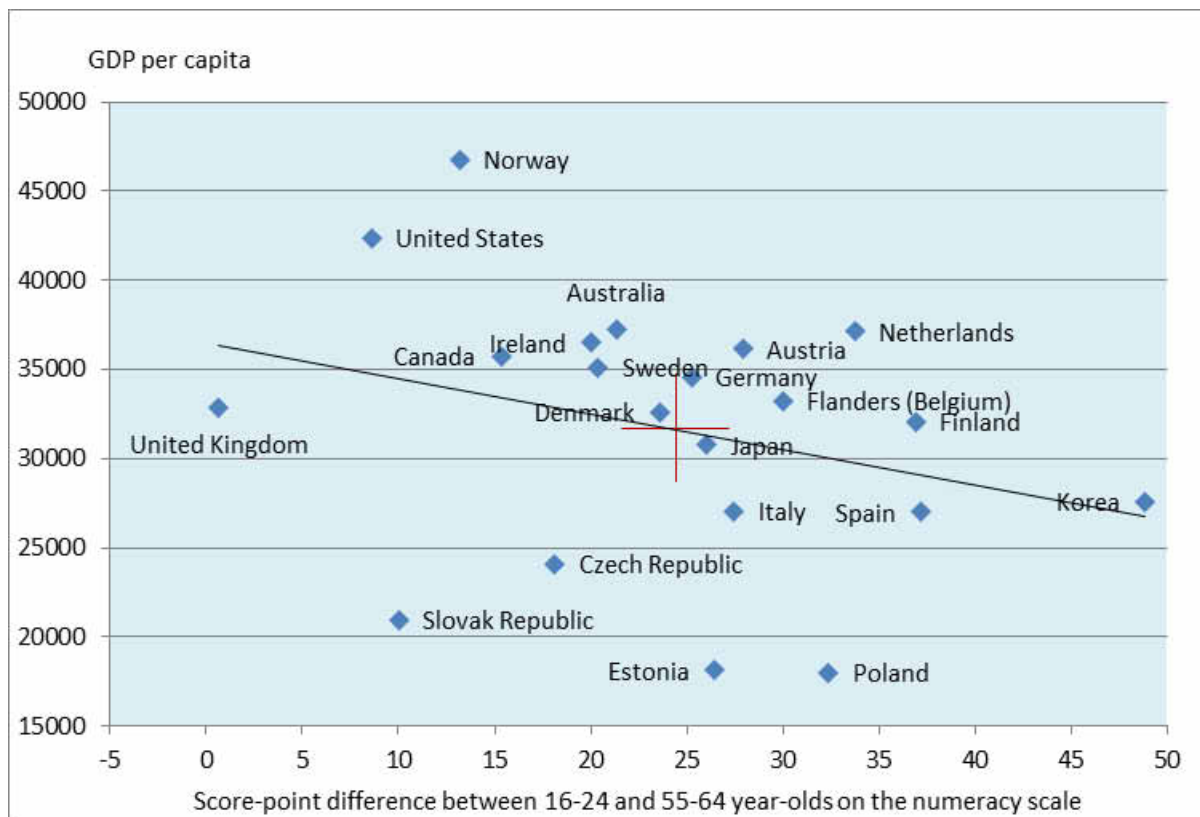


Gaps in skills proficiency between age groups are unrelated to overall social inequality.

The skills distribution by age has no relationship at all (-.01) with social inequality. A smaller gap in proficiency between the youngest and the oldest adults does not seem to have any impact on overall social equality.

There is a weak negative relationship (-.36) between skills distribution by age and per capita GDP. A smaller gap in numeracy proficiency between the youngest and the oldest adults seems to be positively related to economic prosperity, as seen in Norway and the United States, probably because the older generations with better skills have contributed in the past to greater economic output. Countries, such as Poland, with wider skills gaps between younger and older adults are catching up in terms of economic growth. There is no intrinsic economic benefit from having a small skills gap between the age groups.

Figure 6. Relationship between the distribution of numeracy proficiency by age and GDP per capita

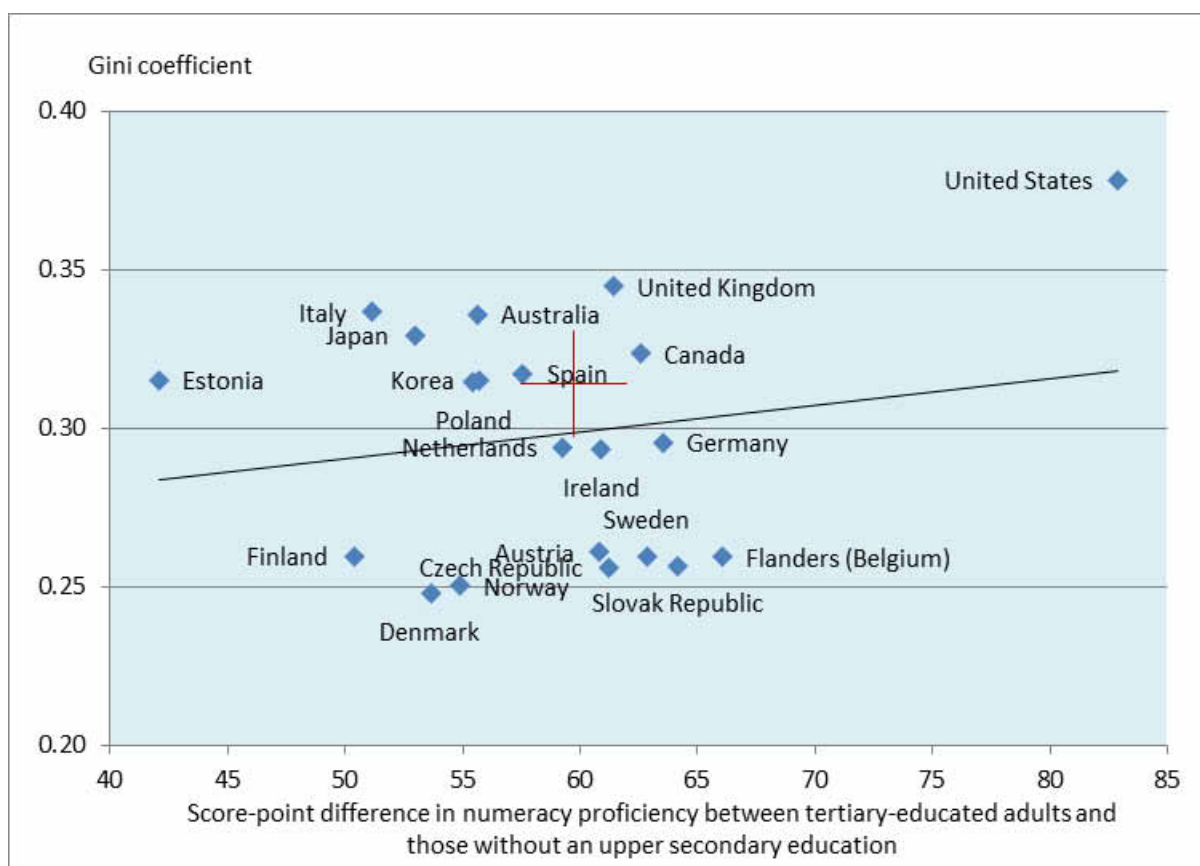


A wider gap in skills proficiency between high- and low-educated adults is somewhat linked to economic performance, but is unrelated to social inequality.

Contrary to expectations, the distribution of numeracy proficiency related to educational attainment (the score-point difference between tertiary-educated adults and those without an upper secondary education) has only a very weak relationship (country-level correlation of .17) to overall inequality, as measured by the Gini coefficient. As **Error! Reference source not found.** illustrates, only the United States reveals both large inequality in numeracy proficiency between high- and low-educated adults and wide income inequality.

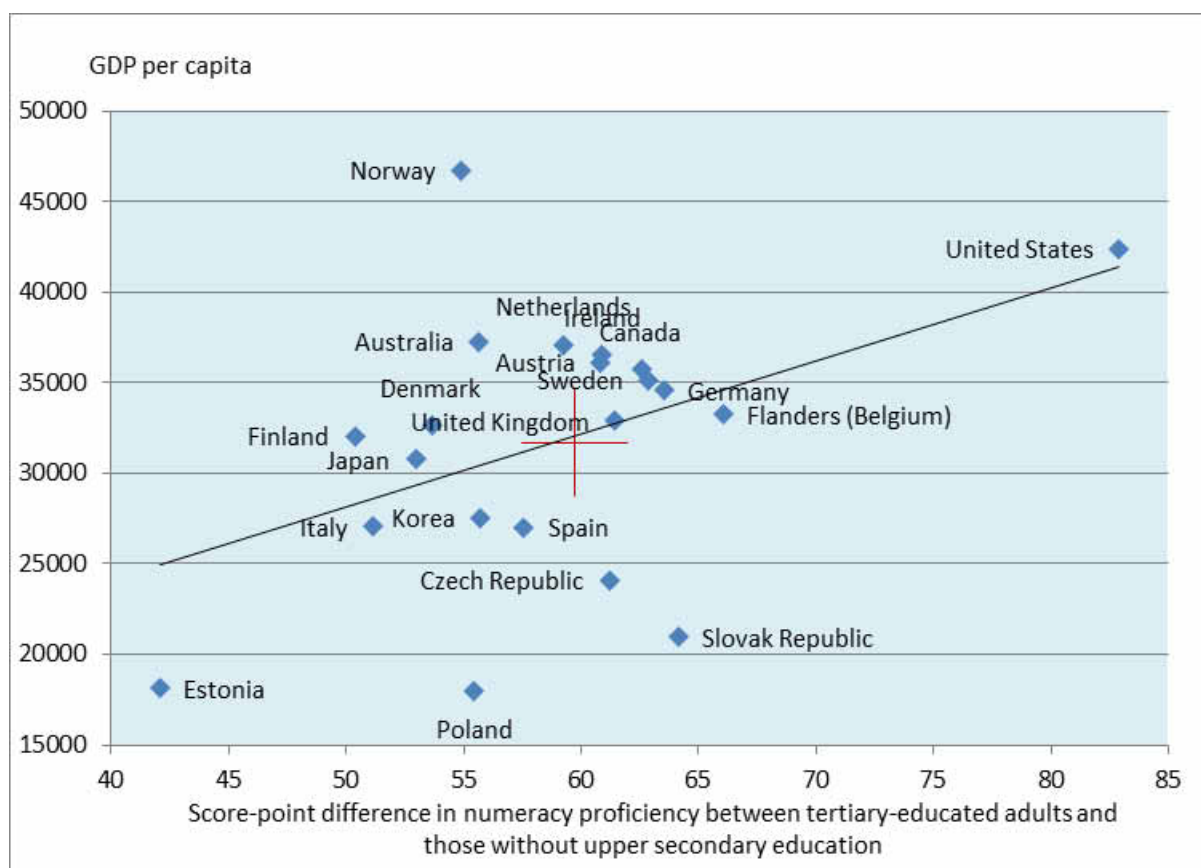
The country-level correlation between the mean numeracy score and the Gini coefficient remains constant over three educational attainment levels (.70 for adults with less than upper secondary education, .67 for adults with upper secondary education, and .73 for adults with tertiary education). Thus, while the mean numeracy score in general and among adults at each level of education is strongly related to social inequality, the score difference between low- and high-educated adults is not.

Figure 7. Relationship between the distribution of numeracy proficiency related to educational attainment and the Gini coefficient



The relationship to economic performance is different. As already noted, the mean numeracy score at the country level is practically unrelated to economic performance (.11), and the correlation remains weak among adults at each educational level (-.14 for adults with less than upper secondary education, .03 for adults with upper secondary education, and .14 for adults with tertiary education). However, the difference in numeracy proficiency between tertiary-educated adults and those without an upper secondary education has a fairly strong, positive correlation (.43) to economic performance as measured by per capita GDP. National income seems to be somewhat associated with a distribution of skills proficiency in which adults with higher educational attainment acquire greater numeracy skills.

Figure 8. Relationship between the distribution of numeracy proficiency related to educational attainment and GDP per capita



A wider dispersion of skills among low-educated adults is unrelated to social inequality, but among mid-educated adults it is somewhat positively associated with economic prosperity.

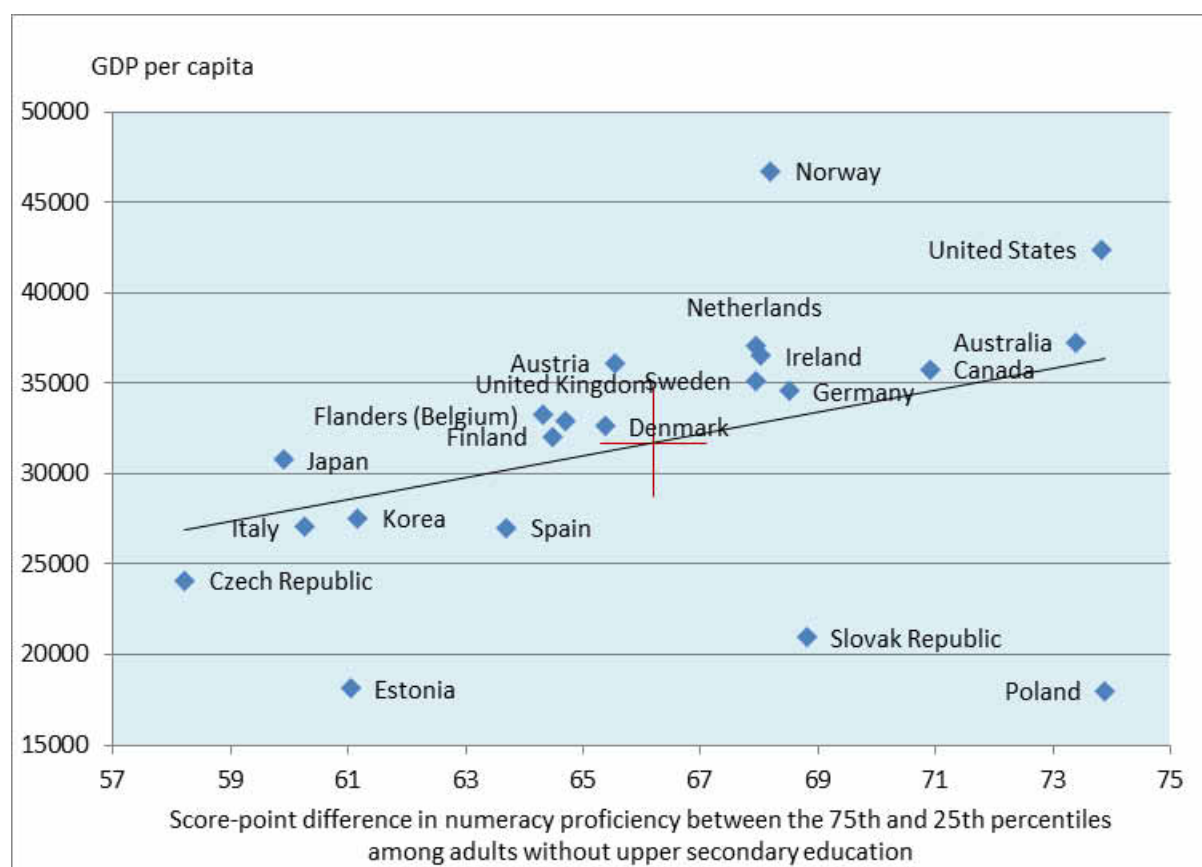
In the next section we will look at the skills distribution within each of the three educational attainment levels. One might object that, as has been demonstrated by the OECD Adult Skills Survey (PIAAC), the educational attainment levels do not represent the same point on the skills scale and include different parts of the adult population in each country. But educational attainment levels signify important institutional divisions in the labour market and the wider society, which are supposed to represent comparable realities across countries. It is interesting to examine whether the width of the skills distribution within each level is related to either social inequality or economic performance. A hypothesis might for example be that social arrangements which provide opportunities for low-educated adults to upgrade their skills, leading to a wider disparity in skills among the low-educated, work against social equality. Or that social inequality is linked to the prevalence of higher-educated adults losing their skills. For each educational attainment level we will look at the score point difference between the 75th and 25th percentiles to estimate the width of the distribution.

Distribution of skills proficiency among adults with less than upper secondary education

The skills distribution among low-educated adults has very little relationship (country-level correlation of .19) with overall inequality. It doesn't seem to hold that less inequality in numeracy proficiency among low-educated adults is related to less overall social inequality.

But the relationship with economic prosperity, as measured by GDP per capita, seems to be somewhat stronger (.38). This suggests that greater skills inequality among low-educated adults is associated with increased economic output. One reason for this may be that larger numbers of low-educated adults who overcome their educational disadvantage by acquiring better numeracy skills are associated with greater entrepreneurship and positive economic conditions. This seems to be the case in Australia, Canada, the United States and, in a somewhat less prosperous context, Poland.

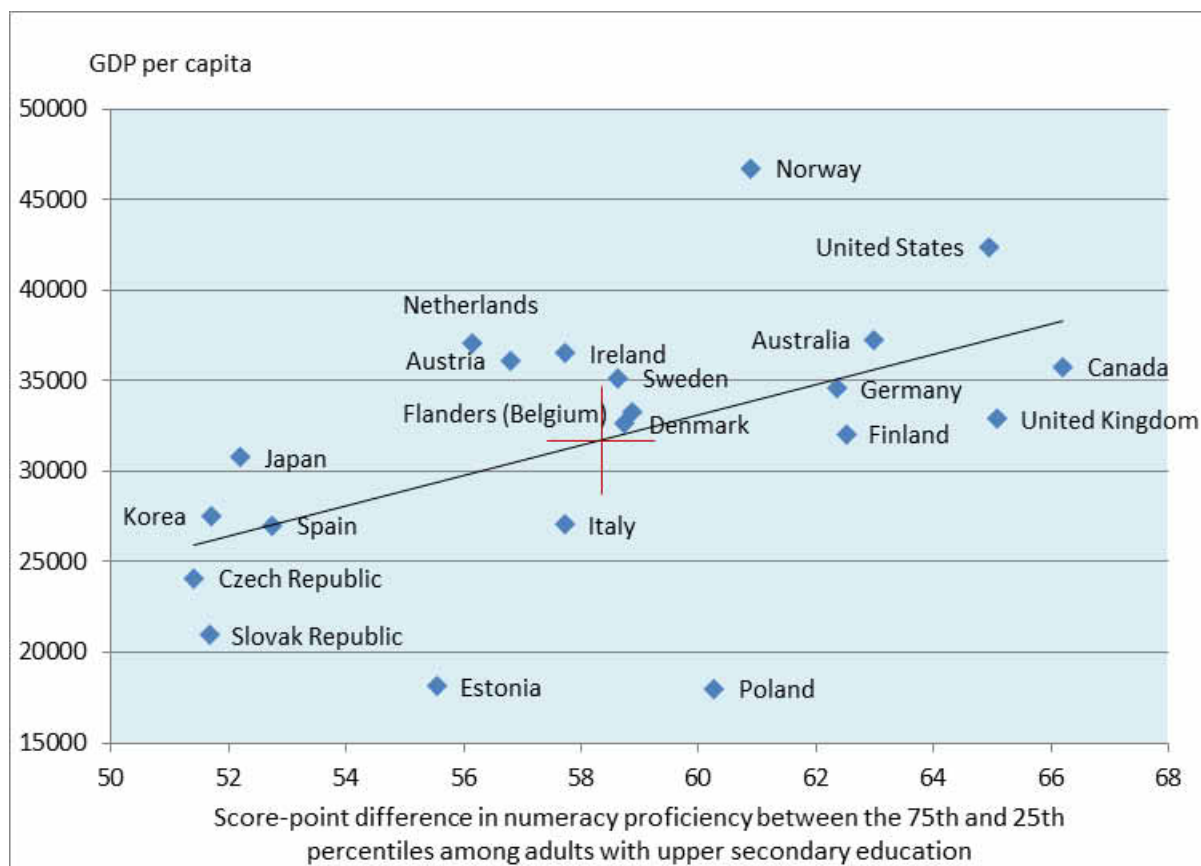
Figure 9. Relationship between the distribution of numeracy proficiency among low-educated adults and GDP per capita



Distribution of skills proficiency among adults with an upper secondary education

This relationship becomes even stronger among adults with an upper secondary education as their highest level of educational attainment. The distribution of numeracy skills among mid-educated adults is positively associated with economic prosperity (.53). Australia, Canada, Finland, Germany, the United Kingdom and the United States share a high level of economic prosperity with opportunities for mid-educated adults to improve their numeracy skills. The opposite is true in the Czech Republic, Estonia, Japan, Korea, the Slovak Republic and Spain.

Figure 10. Relationship between the distribution of numeracy proficiency among mid-educated adults and GDP per capita



The relationship between overall inequality, as measured by the Gini coefficient, and the distribution of numeracy skills among mid-educated adults is much weaker (.30). Better opportunities for mid-educated adults to improve their skills seem to be associated with higher levels of overall inequality, but the relationship is weak.

Distribution of skills proficiency among adults with a university-level education

A wider distribution of numeracy skills among tertiary-educated adults is positively, albeit weakly, related to inequality (.36) and equally weakly related to economic prosperity (.32). Anglo-Saxon countries, in particular, show relatively wide dispersions of numeracy skills among their tertiary-educated adults.

Figure 11. Relationship between the distribution of numeracy proficiency among highly educated adults and the Gini coefficient

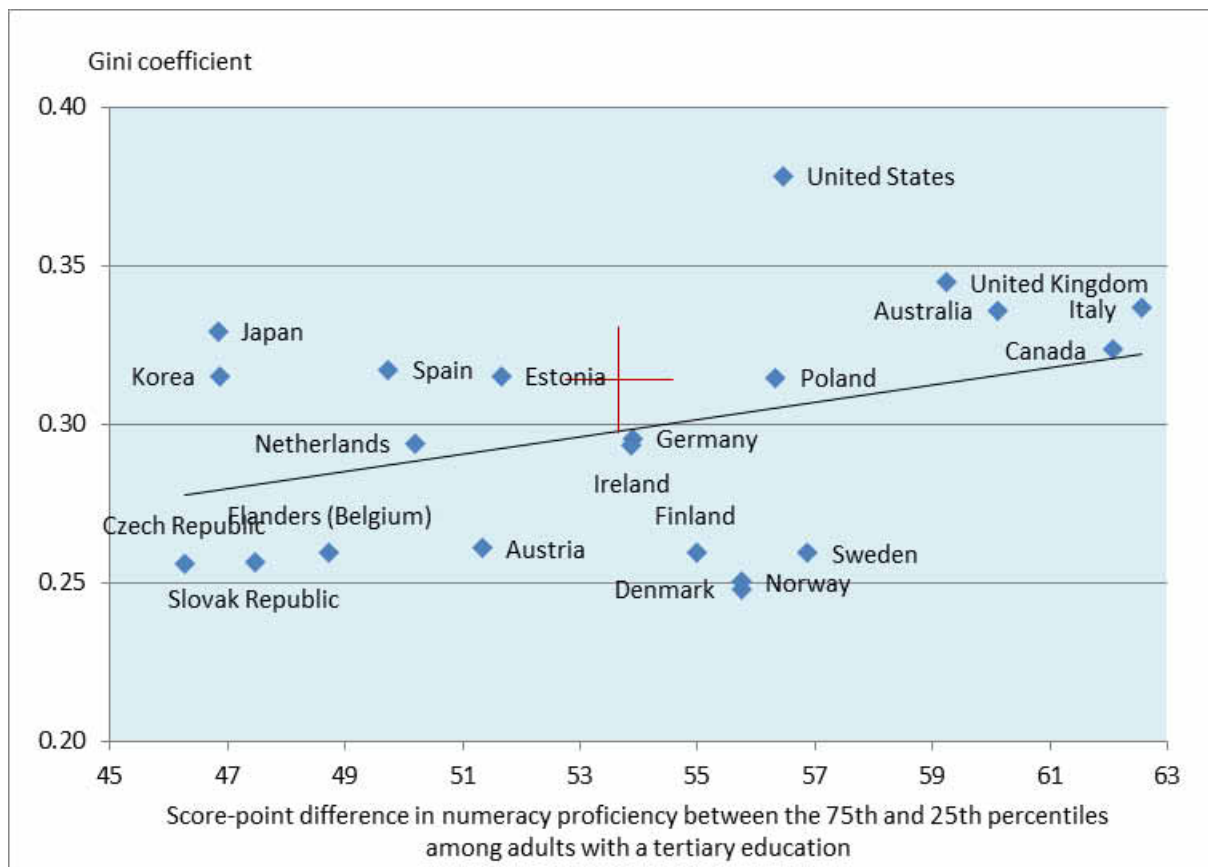
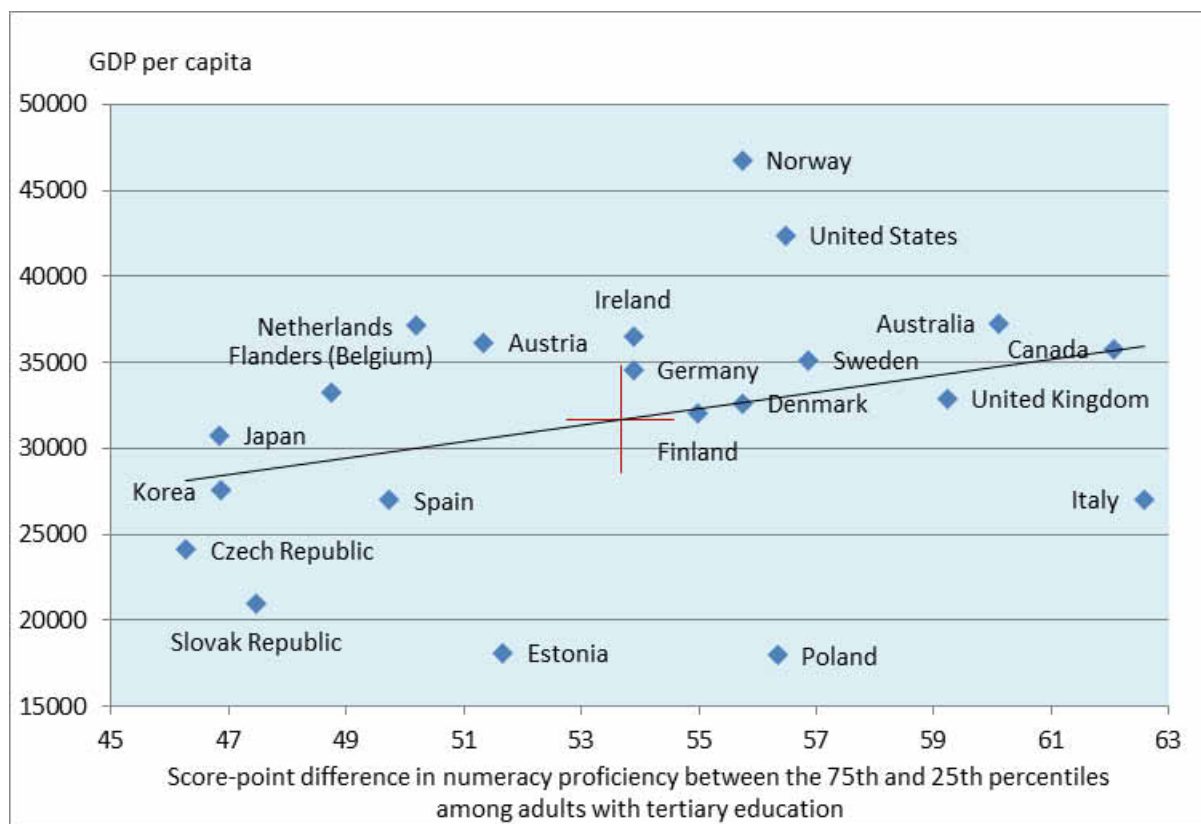


Figure 12. Relationship between the distribution of numeracy proficiency among highly educated adults and GDP per capita



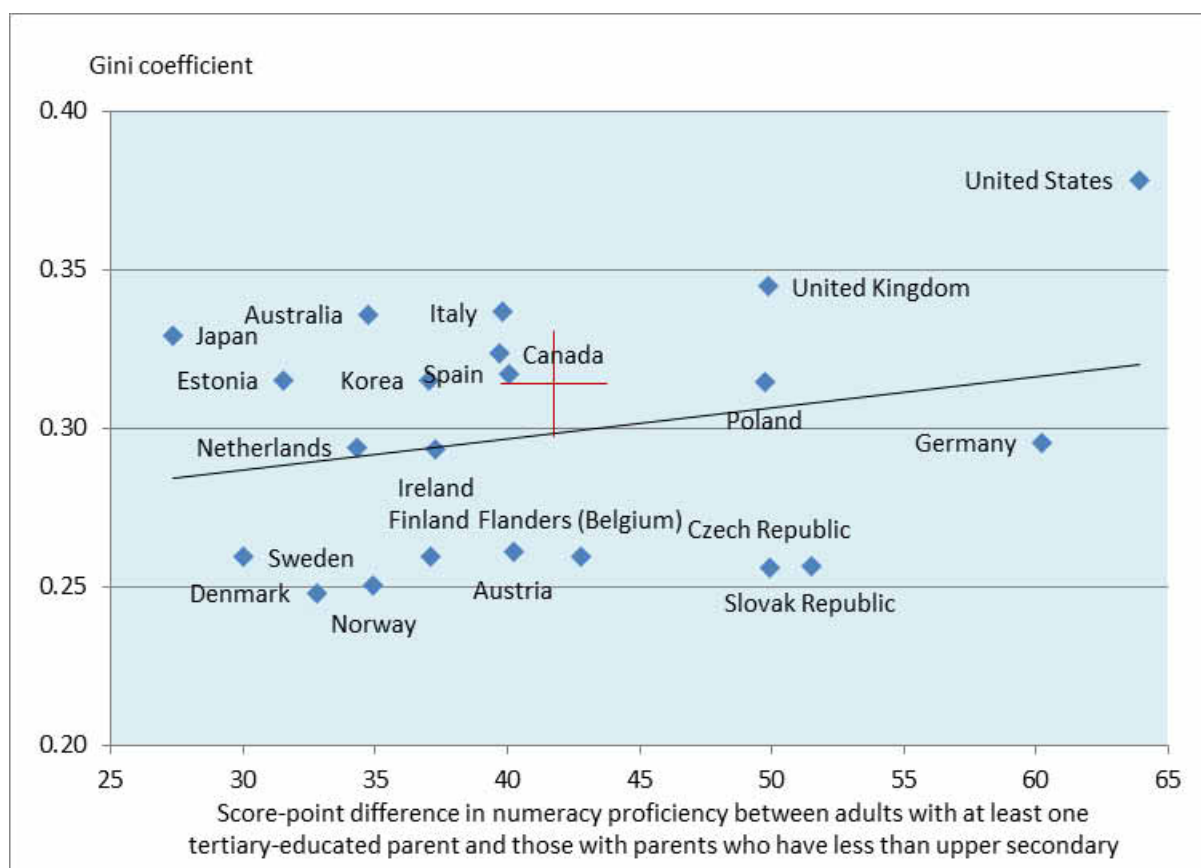
Greater skills inequality related to parents' educational background is only weakly related to overall social inequality.

Adults' proficiency in numeracy is partly influenced by their social and educational background, measured by their parents' level of educational. Skills (dis)advantages are partially transmitted from one generation to the next. The country-level skills inequality related to social background is estimated by calculating the score-point difference in numeracy proficiency between adults with at least one parent who has attained a tertiary education and those with both parents who have less than an upper secondary education. The question then is whether the extent of intergenerational transmission of education and skills (dis)advantages at the country level is related to both measures of equality and prosperity.

The countries' degree skills inequality related to parents' educational background is positively, but weakly, related to inequality (.25). But the correlation seems to be heavily influenced by the position of the United States, which has a relatively high Gini coefficient and high skills inequality between the generations. In most other countries, the relationship seems to be non-existent. Some countries with great social equality still show a relatively wide gap in skills between adults from high-educated backgrounds and those from low-educated backgrounds.

However, there is no country-level relationship between this measure of intergenerational skills proficiency and economic prosperity, as measured by GDP per capita (correlation of -.04).

Figure 13. Relationship between the distribution of numeracy proficiency related to parents' educational attainment and the Gini coefficient



Notes

¹ Head of the Innovation and Measuring Progress Division, Directorate for Education and Skills, OECD.

² Numeracy skills generally are more predictive of social and economic outcomes than literacy skills. Similar, but generally weaker, relationships can be found with literacy skills.

³ A higher Gini coefficient means more income inequality.

⁴ In constant 2005 prices and PPP (US\$)

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