



Measuring numeracy skills mismatch with PIAAC data

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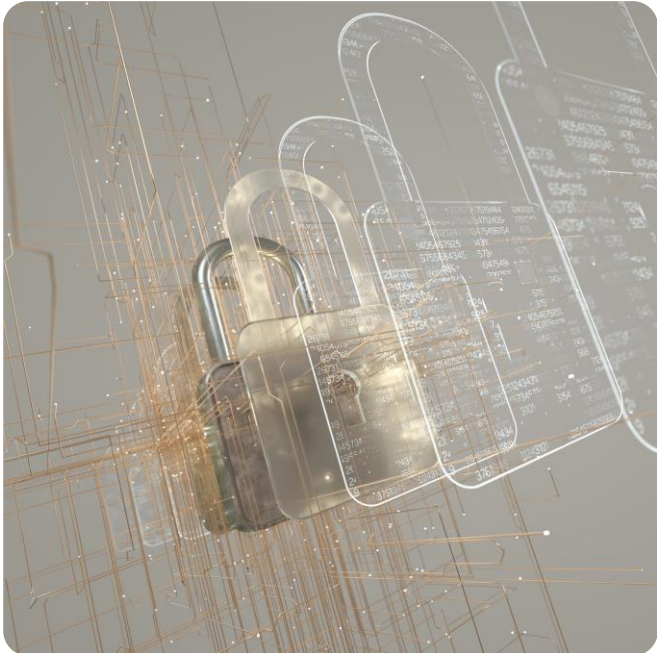
Introduction

First chapter of The European Pillar of Social Rights says:

“Everyone has the right to quality and inclusive education, training and life-long learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labour market”

One of the priorities of the European Commission (2019-2024) *“to ensure that people have the right skills for the jobs of today and tomorrow, and equal opportunities”*.





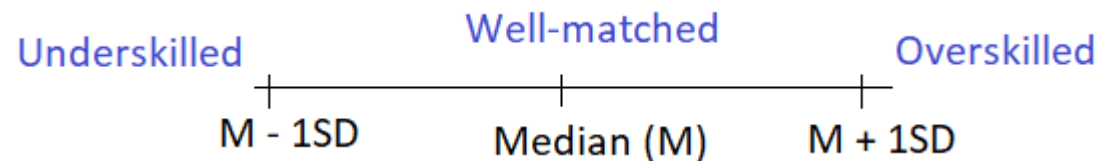
Introduction

- Skills mismatch has a number of negative effects
 - Lower job satisfaction and wages, skill depreciation, higher staff turn over, inefficiencies, unemployment, lower productivity, and lower economic growth
- Aim: identify skills mismatch in order to inform policy makers on lifelong learning with respect to numeracy skills and mismatch
- Focus is on measuring mismatch in numeracy skills using PIAAC data
 - One of the crucial skills in a digitalised 21-century world and determines successful participation in society
 - Numeracy skills are the most comparable throughout different countries



Key concepts and measurement

- Numeracy skills (OECD, 2013)
“the ability to access, use, interpret, and *communicate mathematical information and ideas* to engage in and manage the *mathematical demands* of a range of situations in adult life”
- Skills mismatch
possessed skills does not adequately meet the required skills at workplace
- Realized Match approach conform Brun-Schamme & Rey (2021):
for every double-digit occupation per country with $n > 25$, we use the numeracy proficiency score to identify:

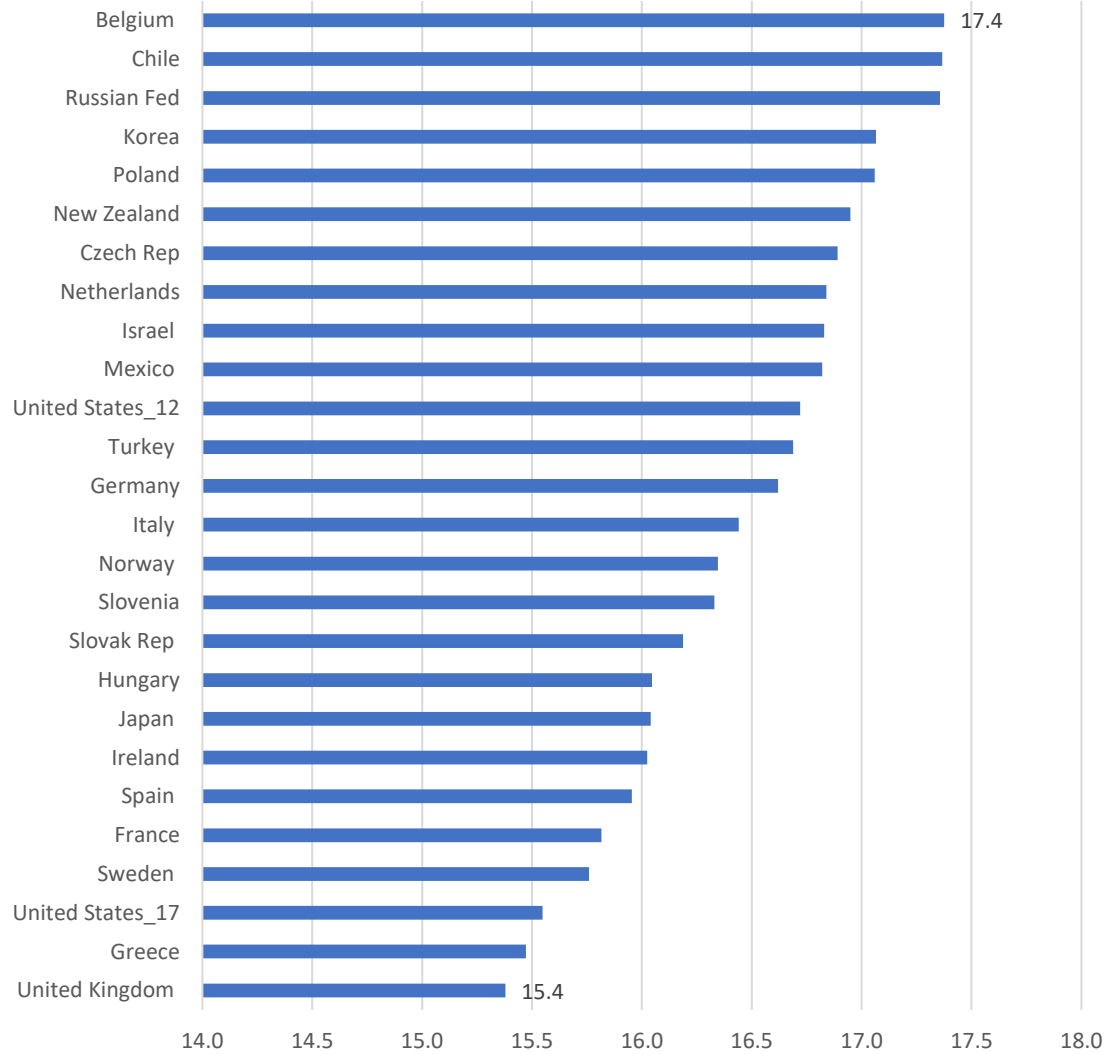


Note: REPEST package in STATA was used to calculate the median and SD but only the first PV of numeracy proficiency was used to distinguish between being well-matched or not

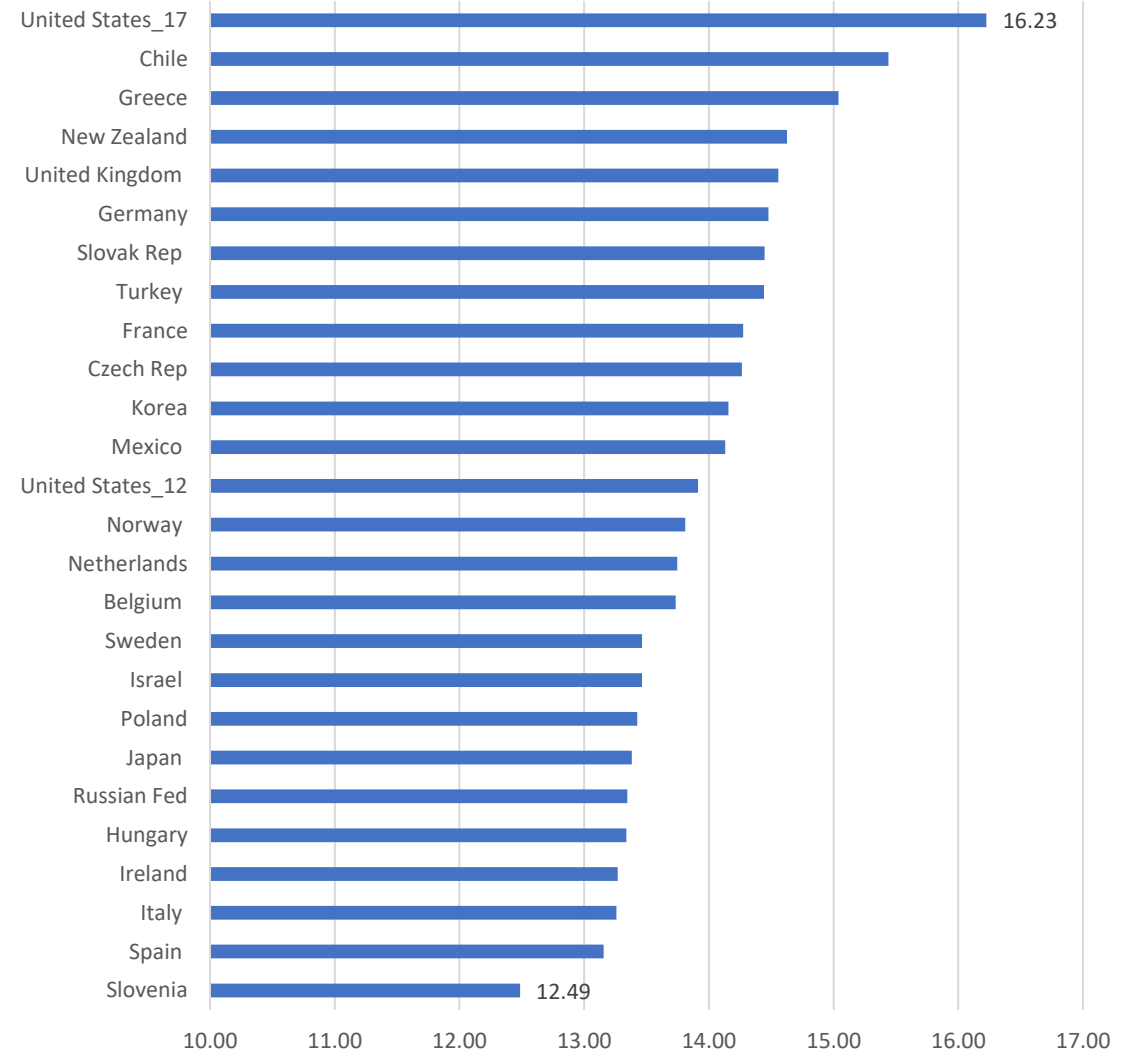
Data and method

- The PIAAC dataset
 - 25 countries* out of 40 and 28 occupations
- Sample
 - size \pm 5000 people per country; multistage clustered design
- Method Binary logistic regression of being under-skilled and over-skilled respectively on
 - At individual level: gender, age-group, education level, area of study, migrant status, occupation group, working part-time or not, firm-size, and numeracy use at work
 - At country level: tracking and vocational education (education system)
 - Country fixed effects

Percentage of people who are under-skilled



Percentage of people who are over-skilled



Results for mismatch in numeracy skills

Being under-skilled

- Slightly more likely for women w.r.t. men
 - probability 13% vs. 11%
- Significantly more likely for agegroups 55 and older
 - Probability 19% vs. 10% for 24 year or younger

Being over-skilled

- More likely for men than for women
 - probability 17% vs. 11%
 - consistent with earlier studies but contrary to what one would expect
- Significantly more likely for 24 year olds and younger than 55+
 - Probability of 16% versus 9%
 - Younger people are more likely to be in temporary or entry-level jobs

Results for mismatch in numeracy skills

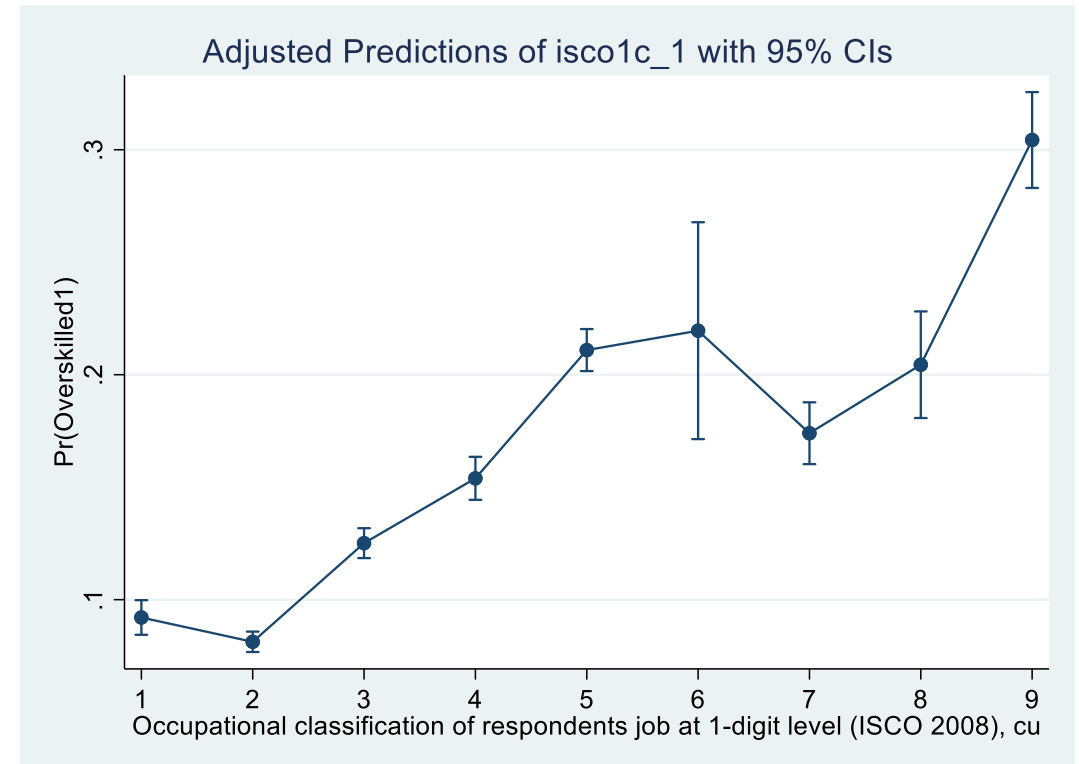
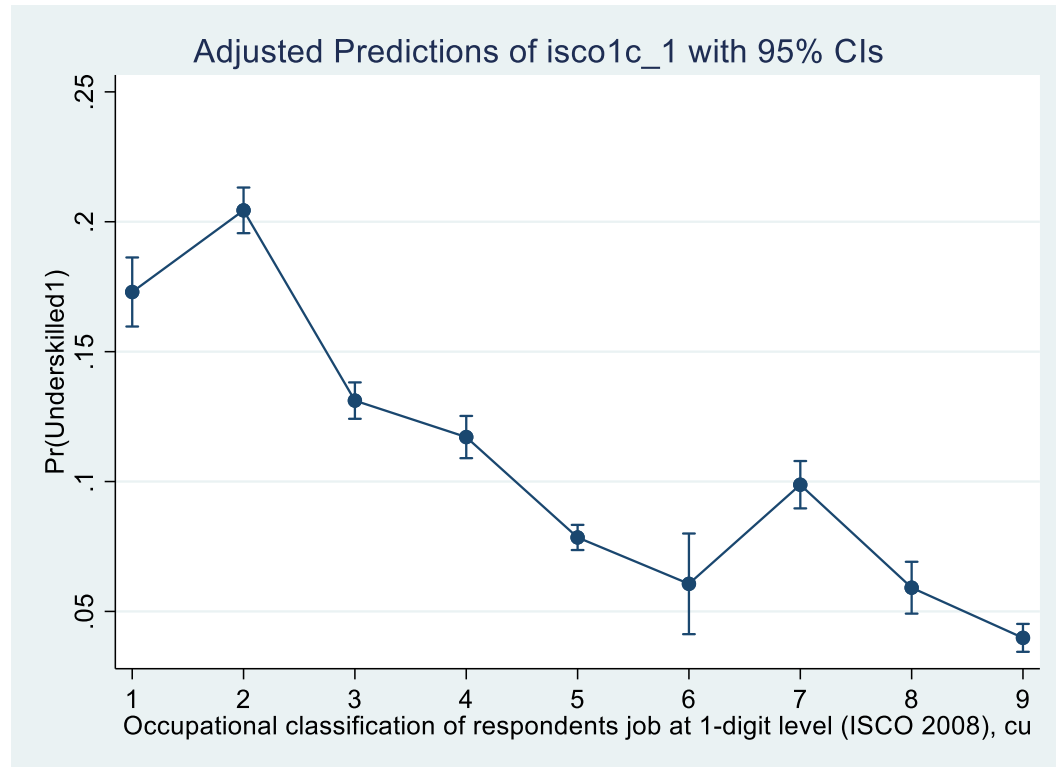
Being under-skilled

- People in lower education levels are more likely to be under-skilled
 - Likelihood of 24% in lowest level versus 6% in highest level
- Least likely for people in elementary occupations

Being over-skilled

- More likely for people in higher education levels
 - 25% vs. 3% in lowest level
- Most likely for people in elementary occupations

Numeracy skills mismatch and occupational classification



Legenda: 1 = Legislators, senior officials and managers, 2 = Professionals, 3 = Technicians and associate professionals, 4 = Clerks, 5 = Service workers and shop and market sales workers, 6 = Skilled agricultural and fishery workers, 7 = Craft and related trades workers, 8 = Plant and machine operators and assemblers, 9 = Elementary occupations

Results for mismatch in numeracy skills

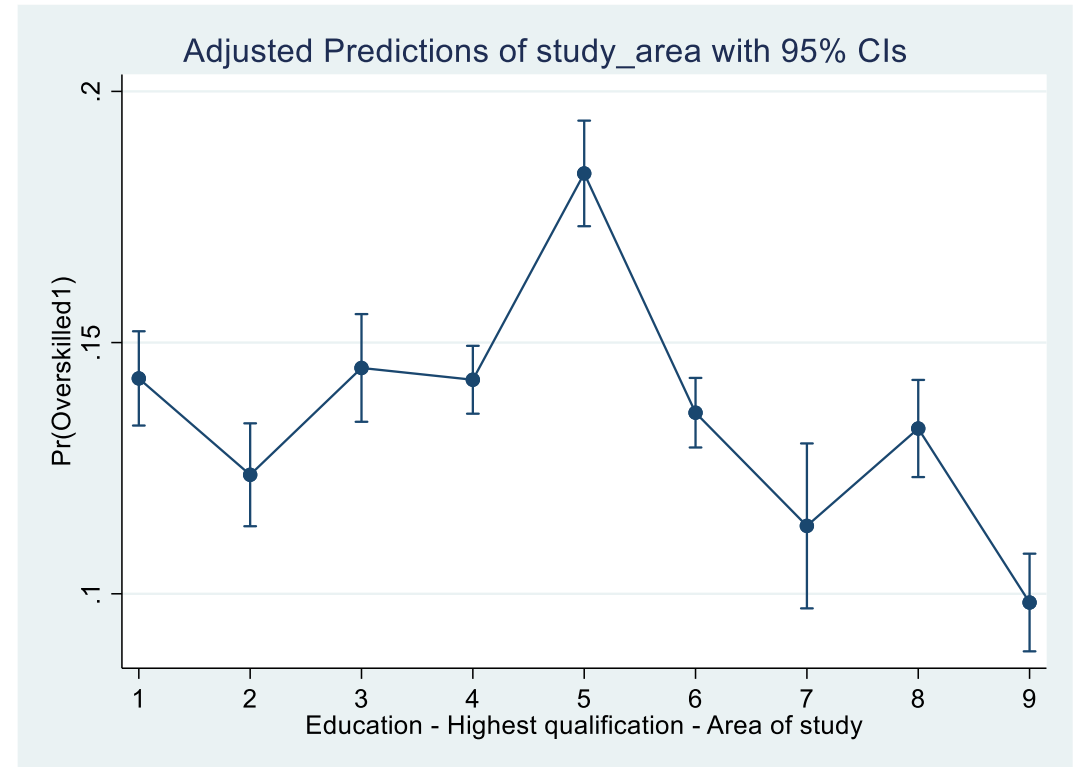
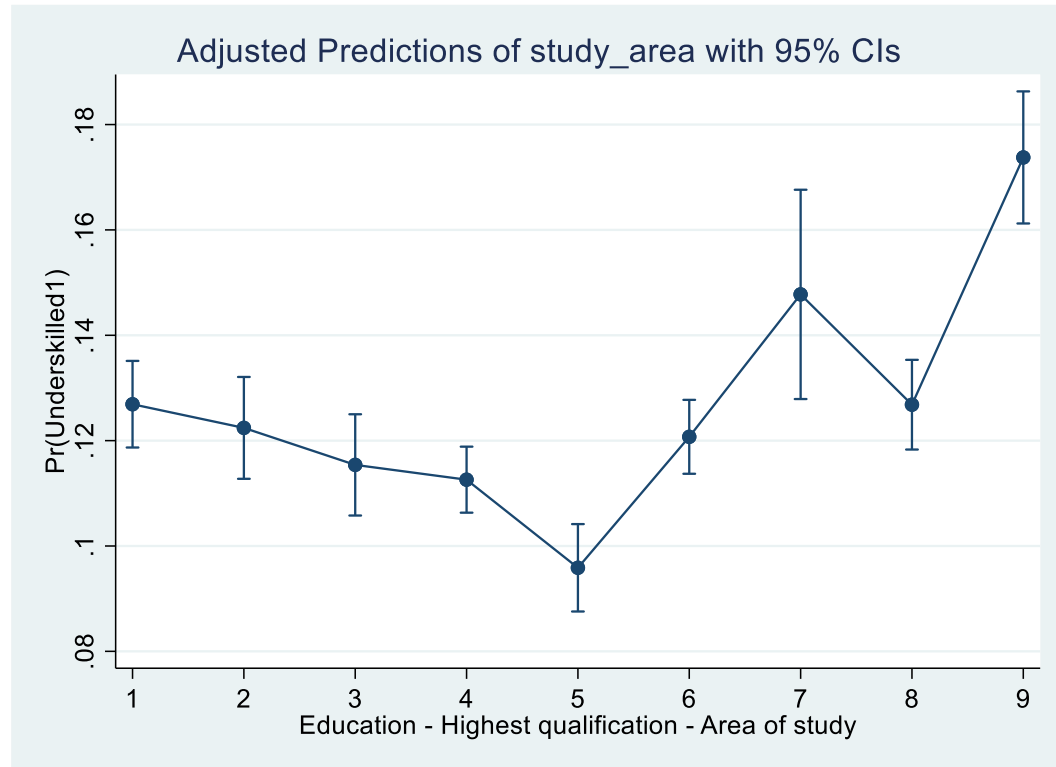
Being under-skilled

- The probability decreases with experience
- More likely for immigrants
 - 20% vs. 11%
- More likely for smaller firms
 - Perhaps due to lower wages

Being over-skilled

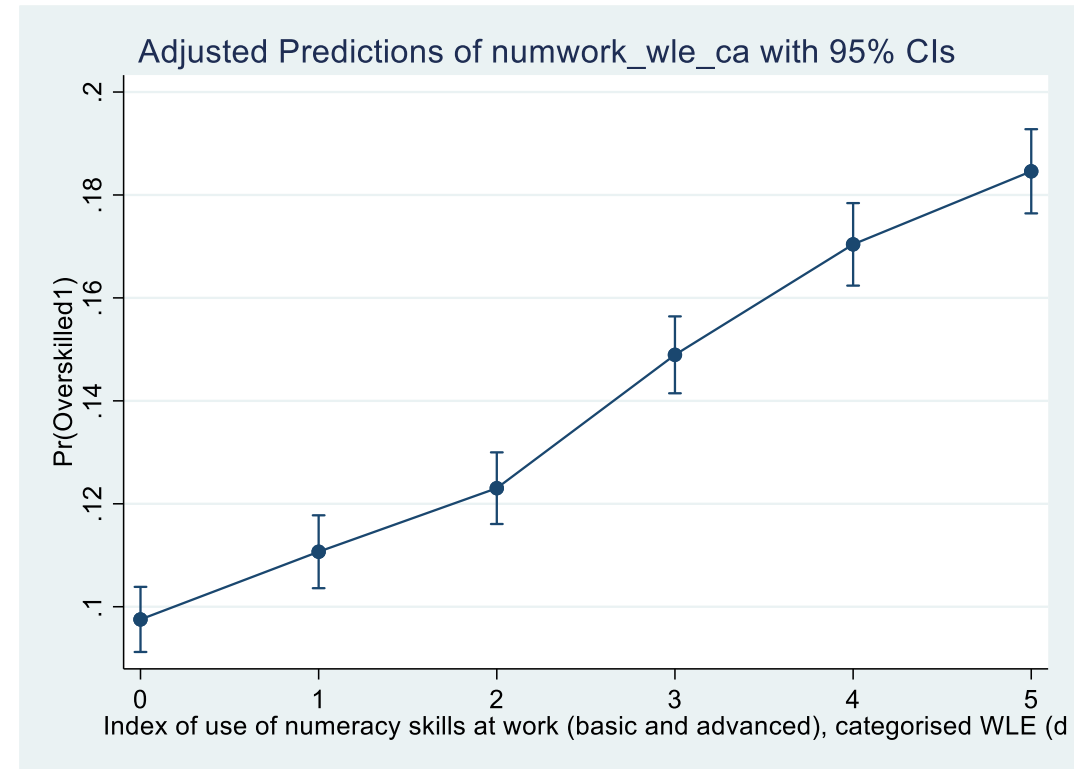
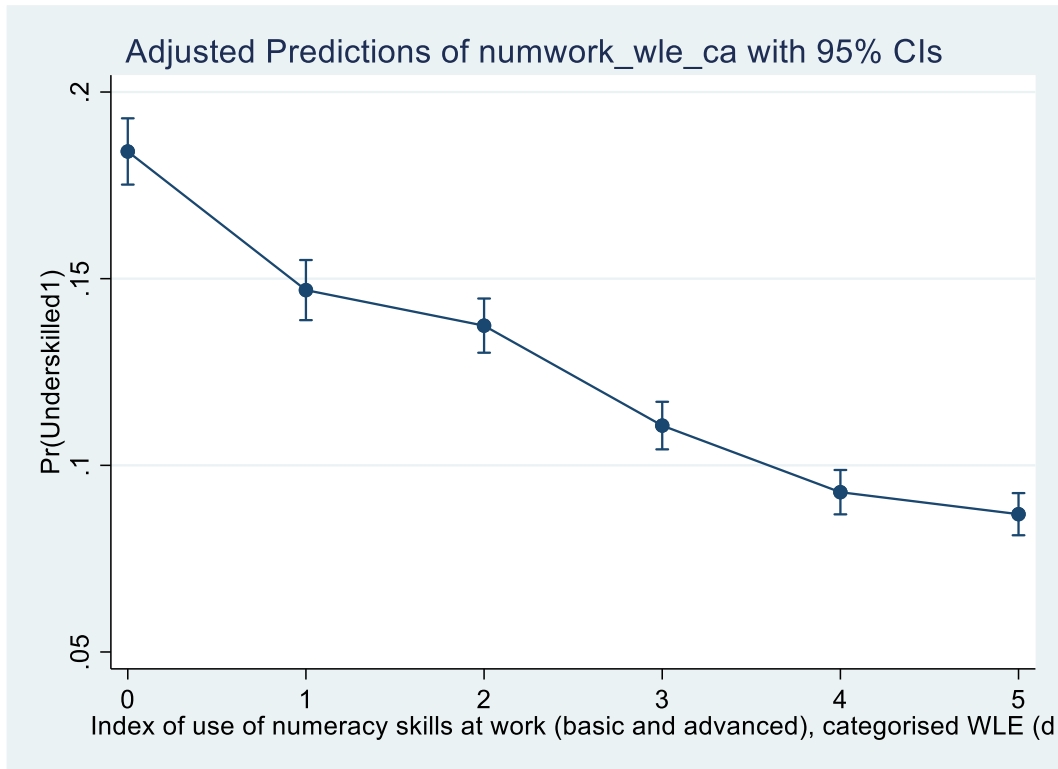
- Also decreases with experience
- More likely for non-migrants
 - 14% vs. 9%
- More likely for larger firms
 - Due to more bureaucracy and complexity, more difficult to obtain good match

Numeracy skills mismatch and area of study



Legenda: 1=General programmes; 2=Teacher training and education science; 3=Humanities, languages and arts; 4=Social sciences, business and law; 5=Science, mathematics and computing; 6=Engineering, manufacturing and construction; 7=Agriculture and veterinary; 8=Health and welfare; 9=Services

Numeracy use



Legenda: 0=All zero response; 1=Lowest to 20%; 2=More than 20% to 40%; 3=More than 40% to 60%; 4=More than 60% to 80%; 5=More than 80% of skills

Skills mismatch and educational system

- Tracking: differentiation in secondary education (Bol en Werfhorst, 2013)
 - Educational track: “Educational programmes are defined on the basis of their educational contact as an array of sequence of educational activities,...”(Unesco, 1997), p..)
- Vocational orientation: “the extent to which education provides students with vocational skills, and the specificity of these skills
 - Do more vocational skills have lower mismatch in numeracy skills?
- Being under-skilled: No significant evidence found for tracking and vocational education
- Being over-skilled: Positive association found between being over-skilled and countries that have more tracked education systems and more vocational education

Concluding remarks

We have studied the association between numeracy skills mismatch and background variables and the education system

Relevant for policies regarding

- Study area; services sector for example
- Use of numeracy skills
- Occupational classifications: more training is needed in some occupations and more alignment in the elementary occupations
- Tracking and vocational education

Points for improvement:

- Study interaction effects
- Suggestions for improving the mismatch measure with PIAAC data
- Suggestions for using robust standard errors considering the plausible values for proficiency scores