



# Measuring numeracy skills mismatch with PIAAC data

Tina Dulam<sup>1&2</sup> & Kees Hoogland<sup>1</sup>

1. University of Applied Science Utrecht

2. Utrecht University

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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”*.





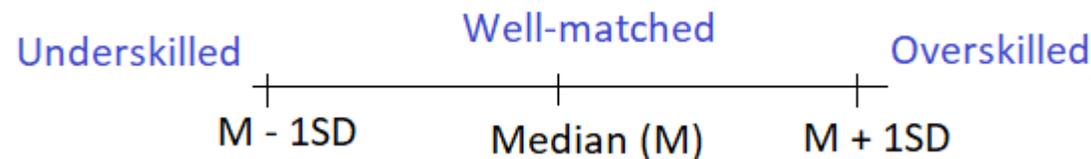
# Introduction

- 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:

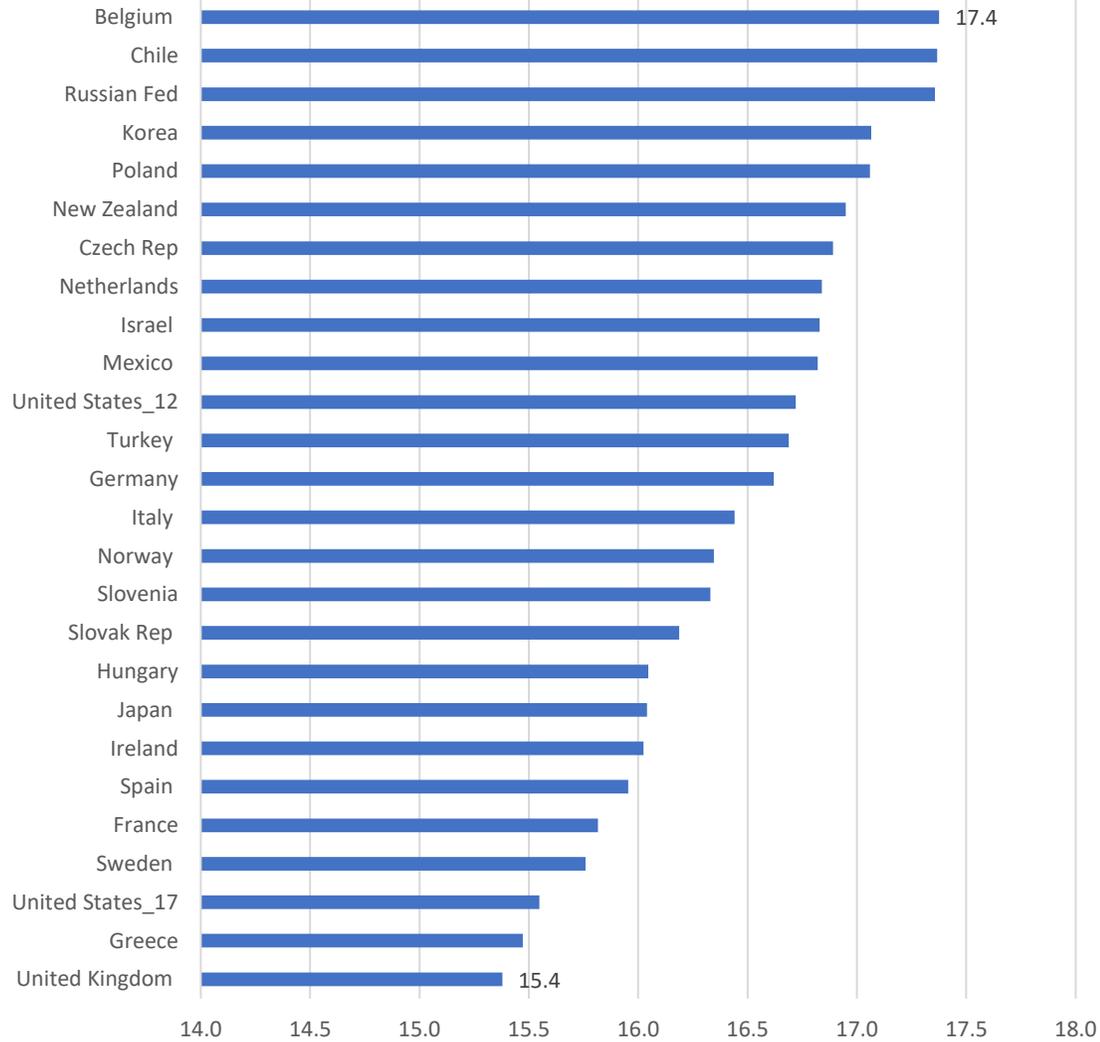


Note: REPEST package in STATA was used to calculate the median and SD but only the first PV of numeracy proficiency was used to distinguish between being well-matched or not

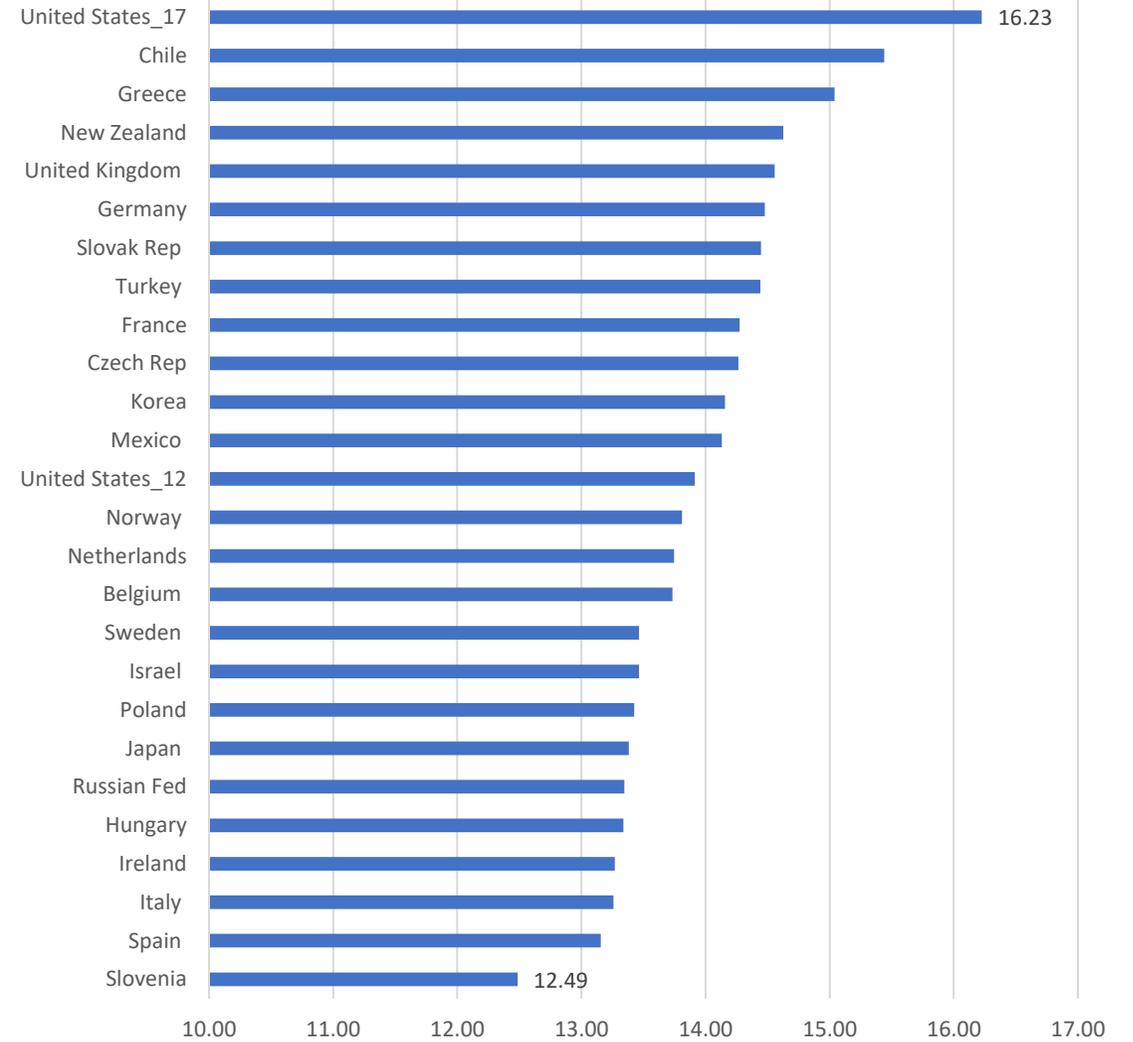
# Data and method

- 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

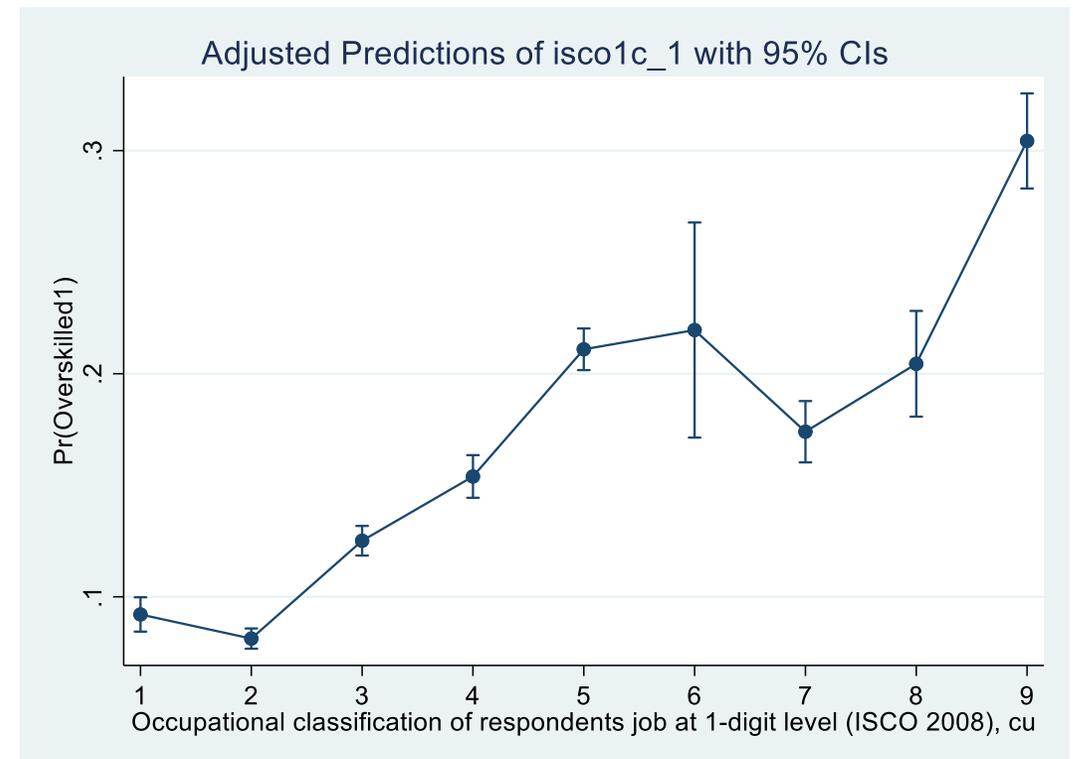
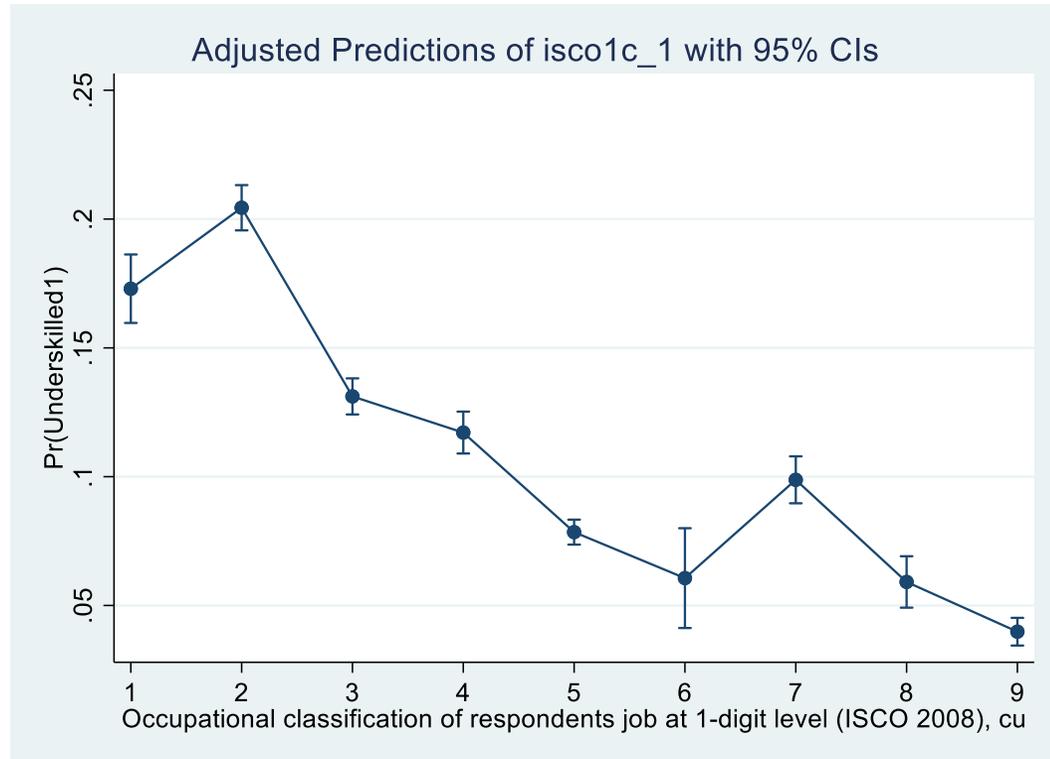
## **Being under-skilled**

- 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

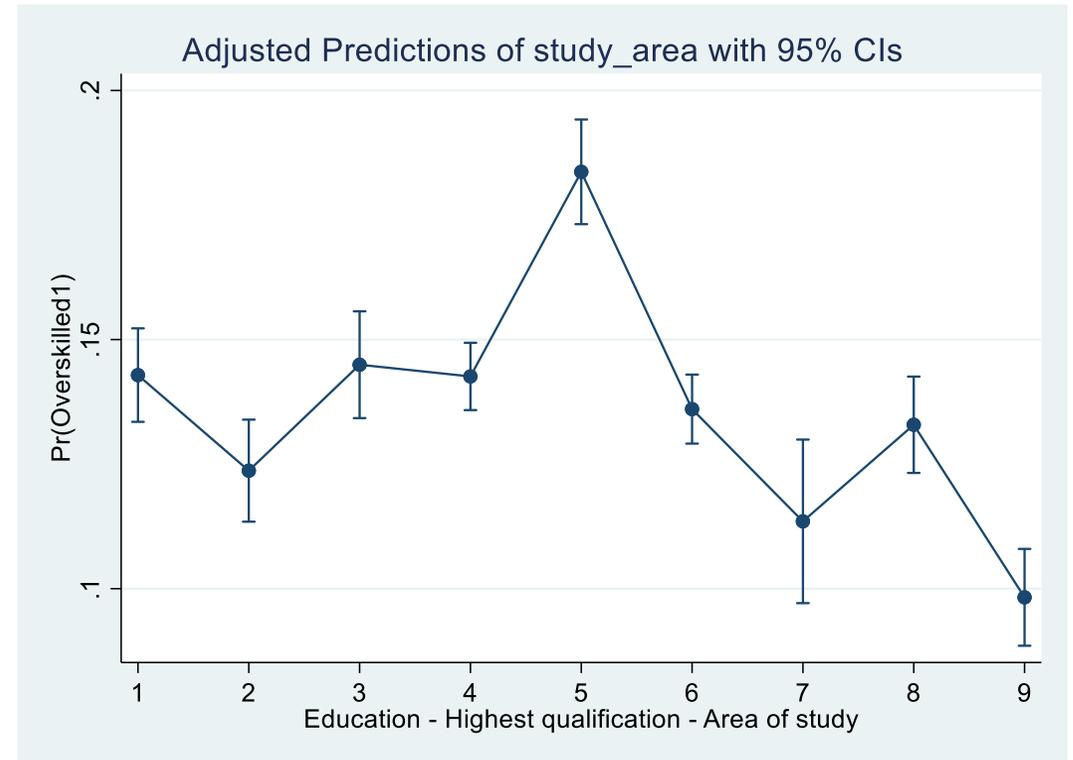
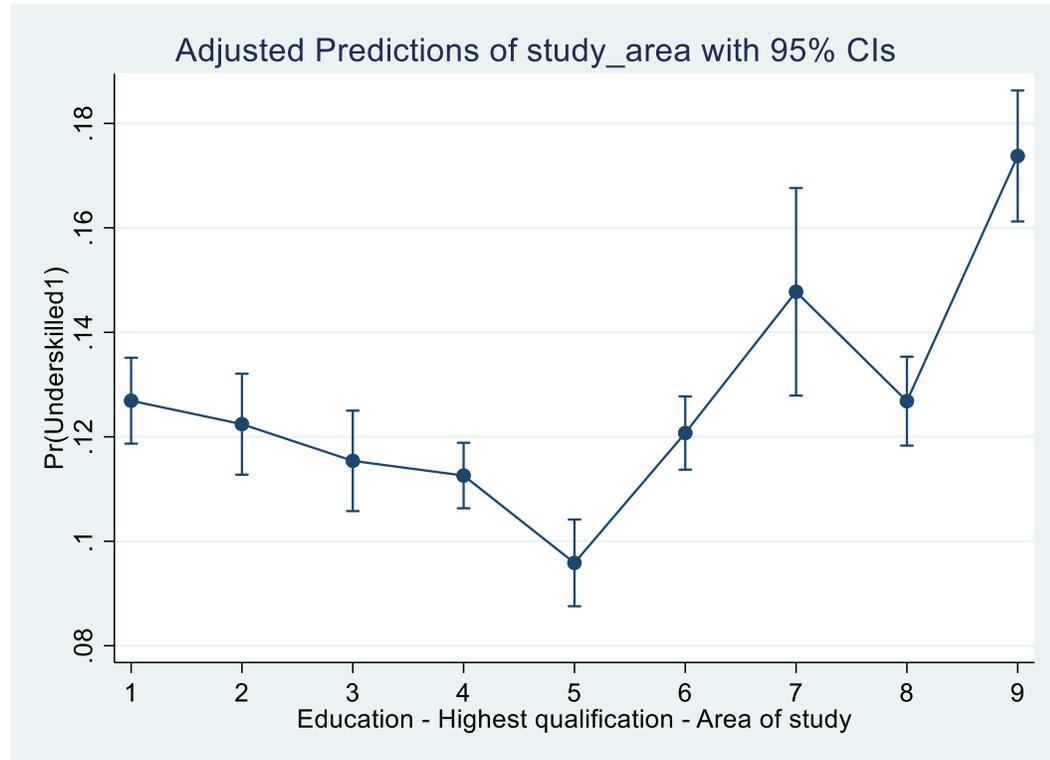
## Being under-skilled

- 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

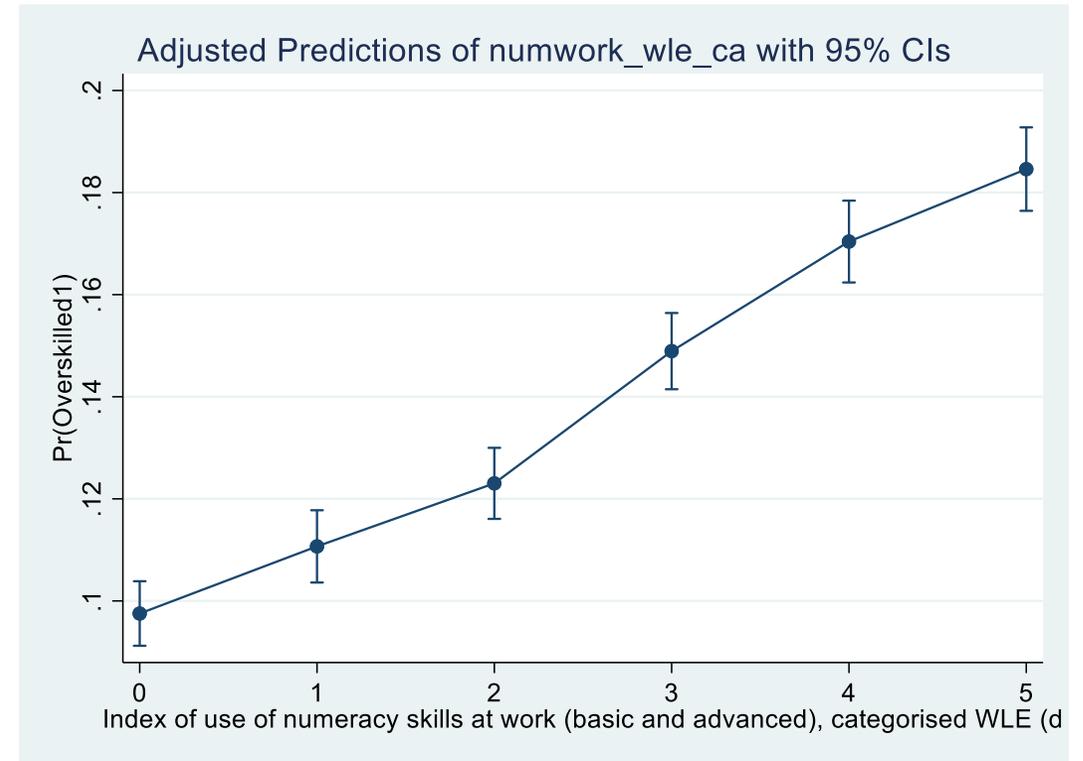
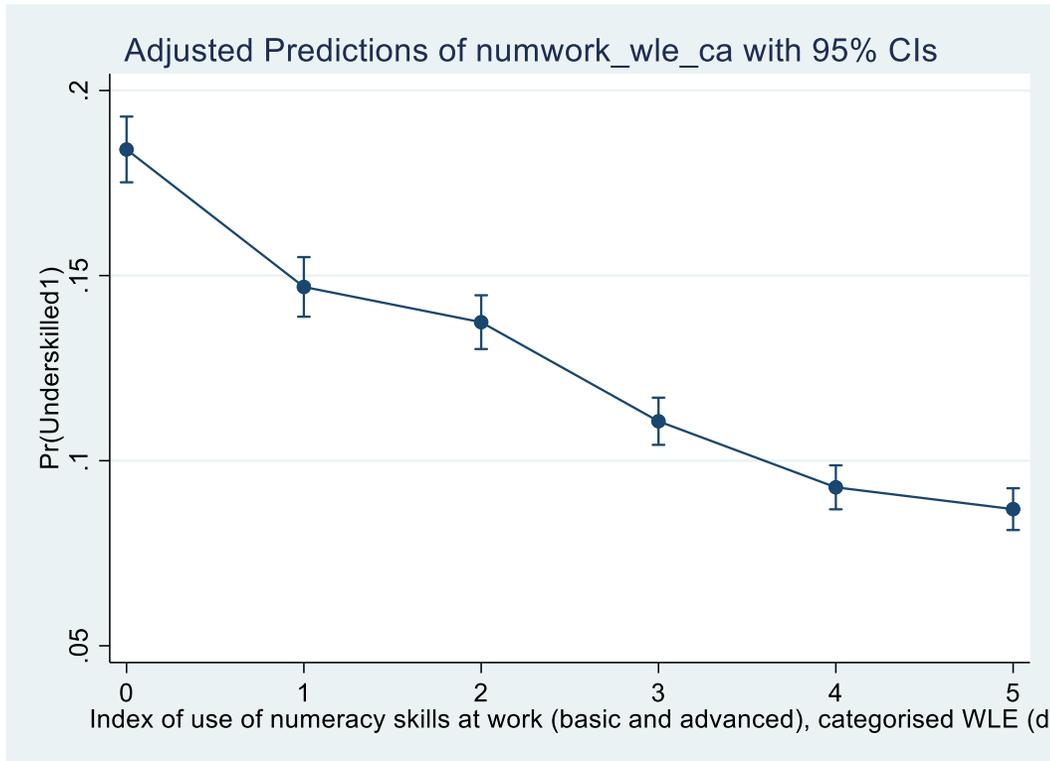
- Also decreases with experience
- More likely for non-migrants
  - 14% vs. 9%
- More likely for larger firms
  - Due to more bureaucracy and complexity, more difficult to obtain good match

# 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