Technequality

Understanding the relation between technological innovations and social inequality

D3.3 - Education systems and requirements

Schools, educations systems and the acquisition of skills relevant to the future of work

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School of Business and Economics

ROA

Aim of research

1. We assess the extent to which **education systems in European countries** effectively support the **acquisition of skills** that will **maximize employability** of school leavers.

2. We examine **cross-national inequality** in the acquisition of these skills by **parents' socioeconomic status** and **gender**.

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Acquisition of skills

Which skills are important for employability?

- Problem solving skills (PS) among 15-year olds (PISA) in 2012
- Computer and Information Literacy (CIL) and Computational Thinking (CT) among 8 graders (ICILS) in 2018
- ICT Skills (PSTRE) among working adults (PIAAC) Cycle 1 (2011-2018)

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Education systems

Which characteristics?

Consider **economic, technological, institutional** and **cultural factors** that we expect being related to individual differences in skills either directly or through restricting or encouraging individual's use of skills.

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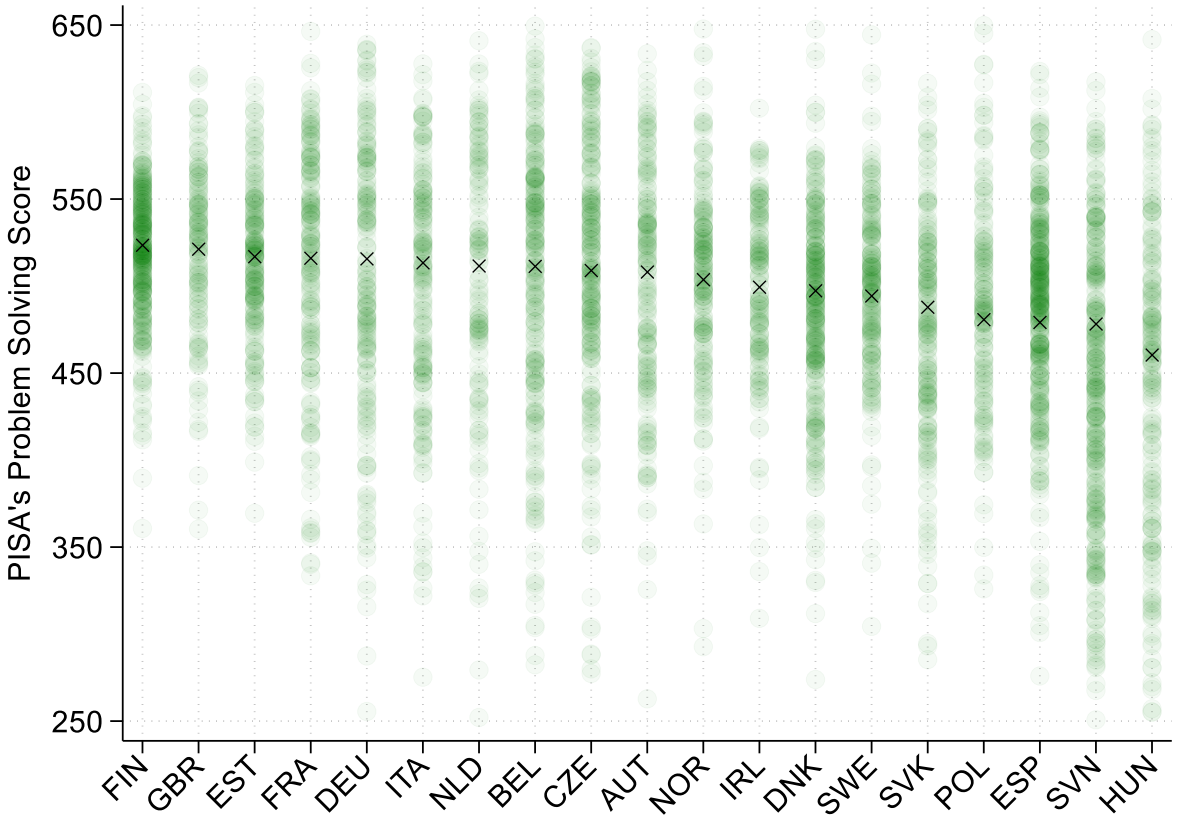
Acquisition of skills

Problem solving skills among 15-year olds (PISA)



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Education systems and skill acquisition

PISA – problem solving

School level variables	(3)	(4)	(5)	(6)	(7)
Private School - Government Dependent	-15.99*				-16.13
	(6.750)				(9.444)
Public School	-32.98***				-30.77**
	(7.524)				(10.58)
School Autonomy		2.765			-0.693
		(2.331)			(1.683)
Extra-curricular Creative Activities			10.73***		10.13***
			(2.615)		(2.614)
Student-Teacher Ratio				2.064**	1.885**
				(0.654)	(0.597)
_cons	362.3***	332.3***	314.2***	307.8***	320.2***
	(35.37)	(35.07)	(36.51)	(37.85)	(40.17)

System level variables	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Standardisation of Input	-14.77*						
	(7.487)						
Standardisation of Output		-7.717					
		(9.324)					
Research and Development Expenditure			7.060				
			(4.596)				
Income Inequality (Gini)				72.77			
				(108.8)			
Digital contact with the Government					0.264		
					(0.254)		
Index of Vocational Enrolment						8.900	
						(7.688)	
PIAAC's Index of Adult's Learning Strategies							11.18
							(23.68)
_cons	317.9***	325.2***	305.9***	299.3***	312.2***	314.4***	279.3**
	(40.40)	(39.08)	(41.34)	(50.87)	(41.72)	(40.08)	(97.25)

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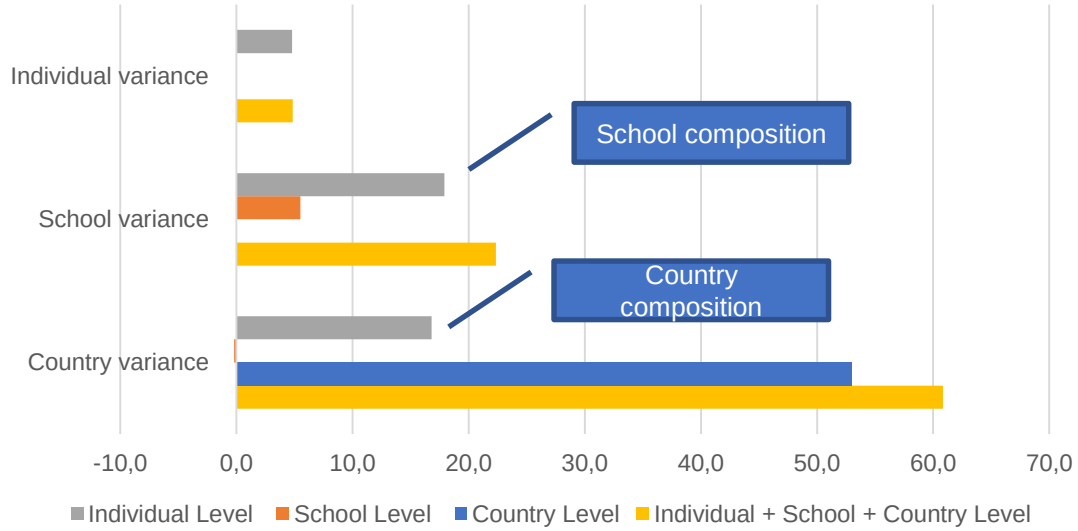
Education systems and skill acquisition

Problem solving skills among 15-year olds (PISA)

- ICC country: 0.040 ; ICC school: 0.429
- Most difference across schools
- Apart from composition effects, most explained difference across systems



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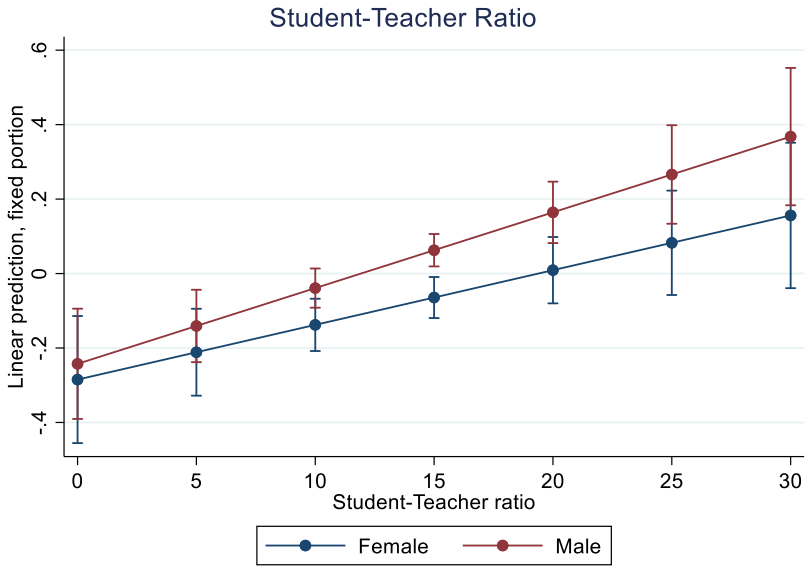
Inequality in acquisition

PISA – problem solving



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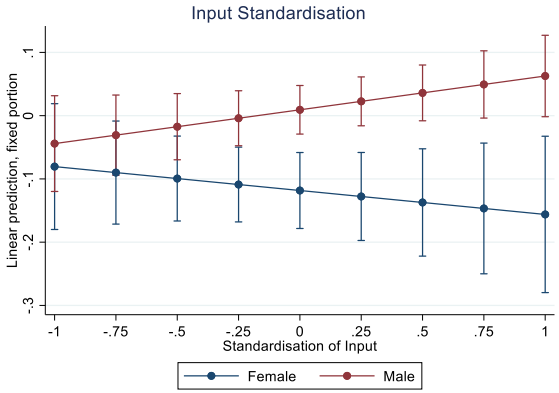
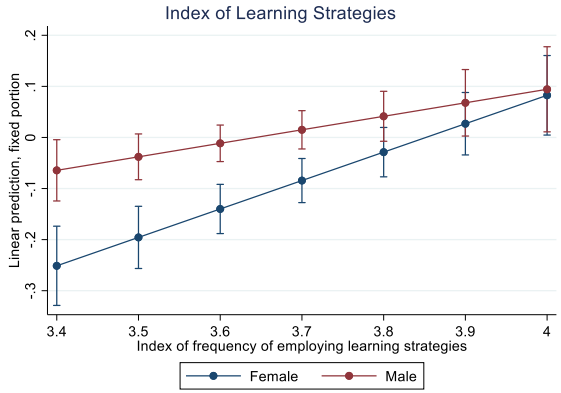
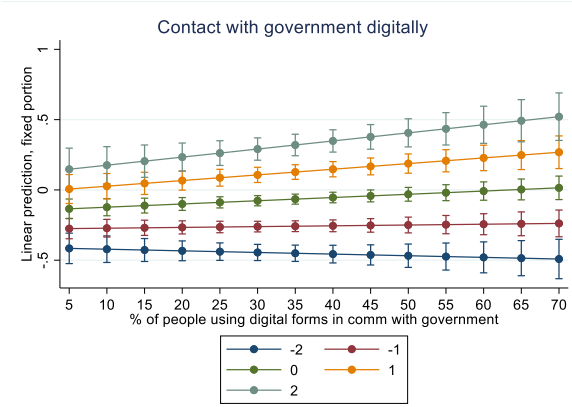
Inequality in acquisition

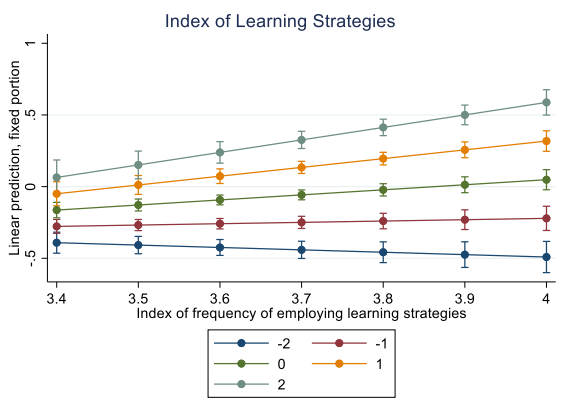
PISA – problem solving





By Sex





By SES

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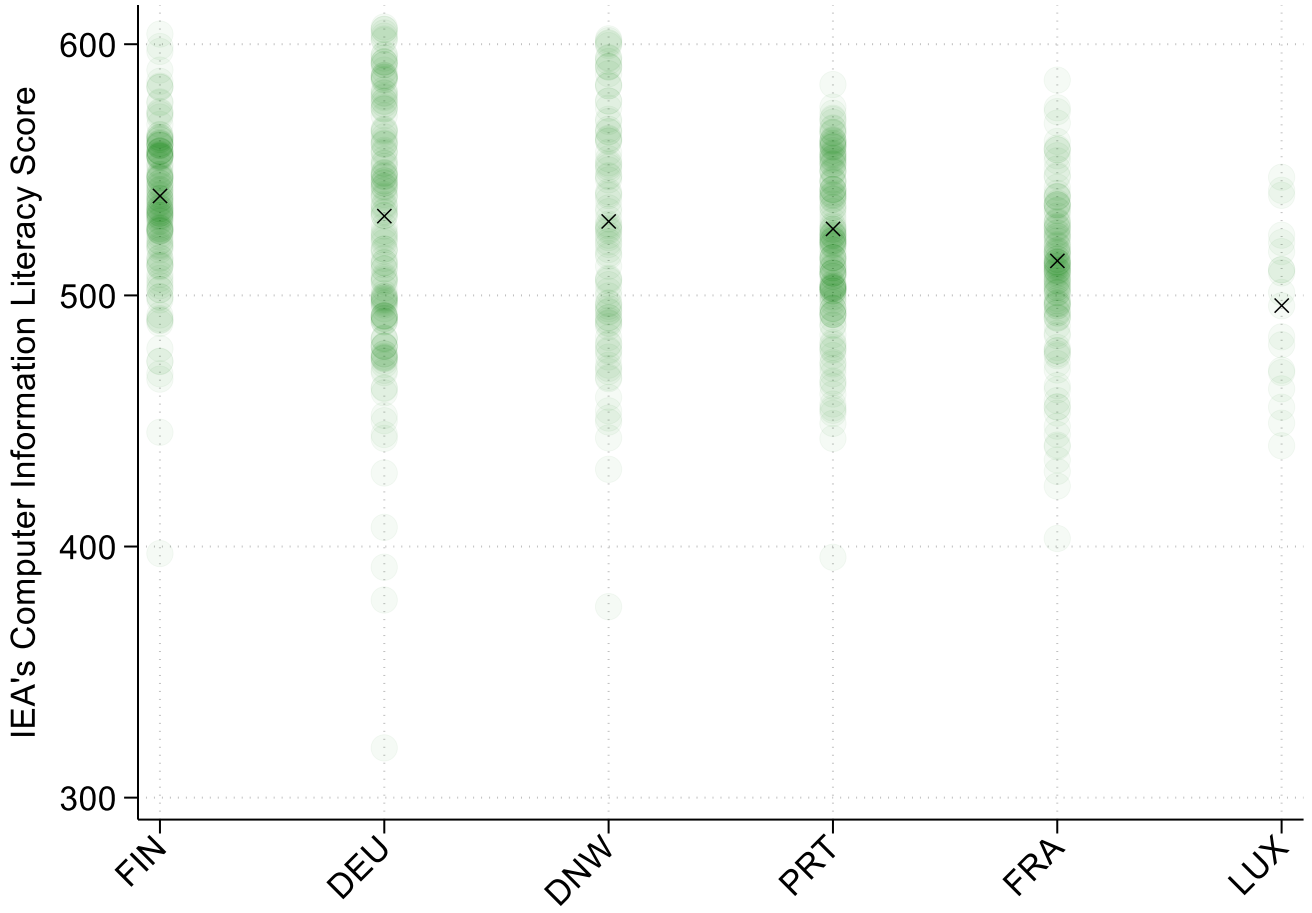
Acquisition of skills

CIL among 8 graders (ICILS)



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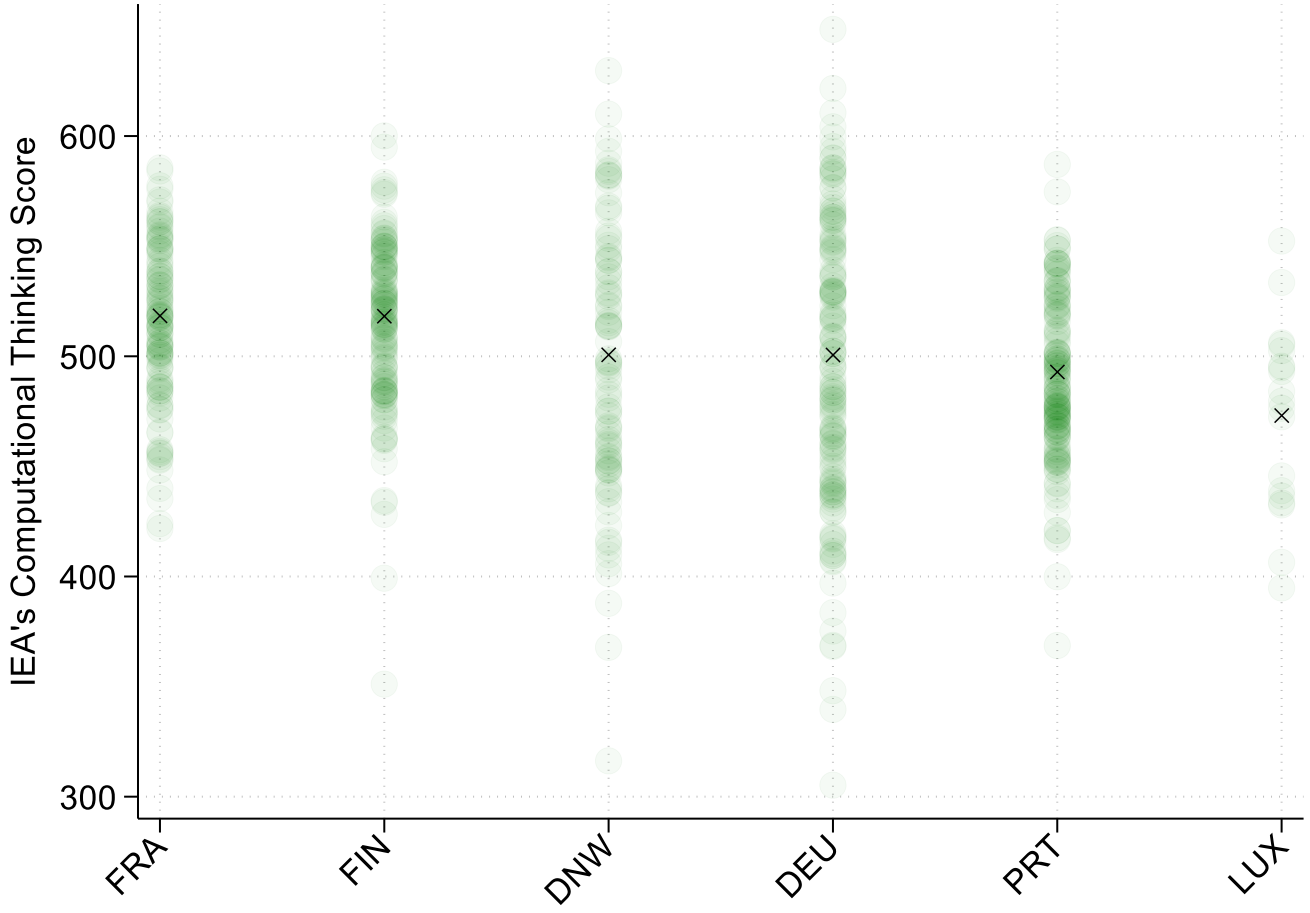
Acquisition of skills

CT among 8 graders (ICILS)



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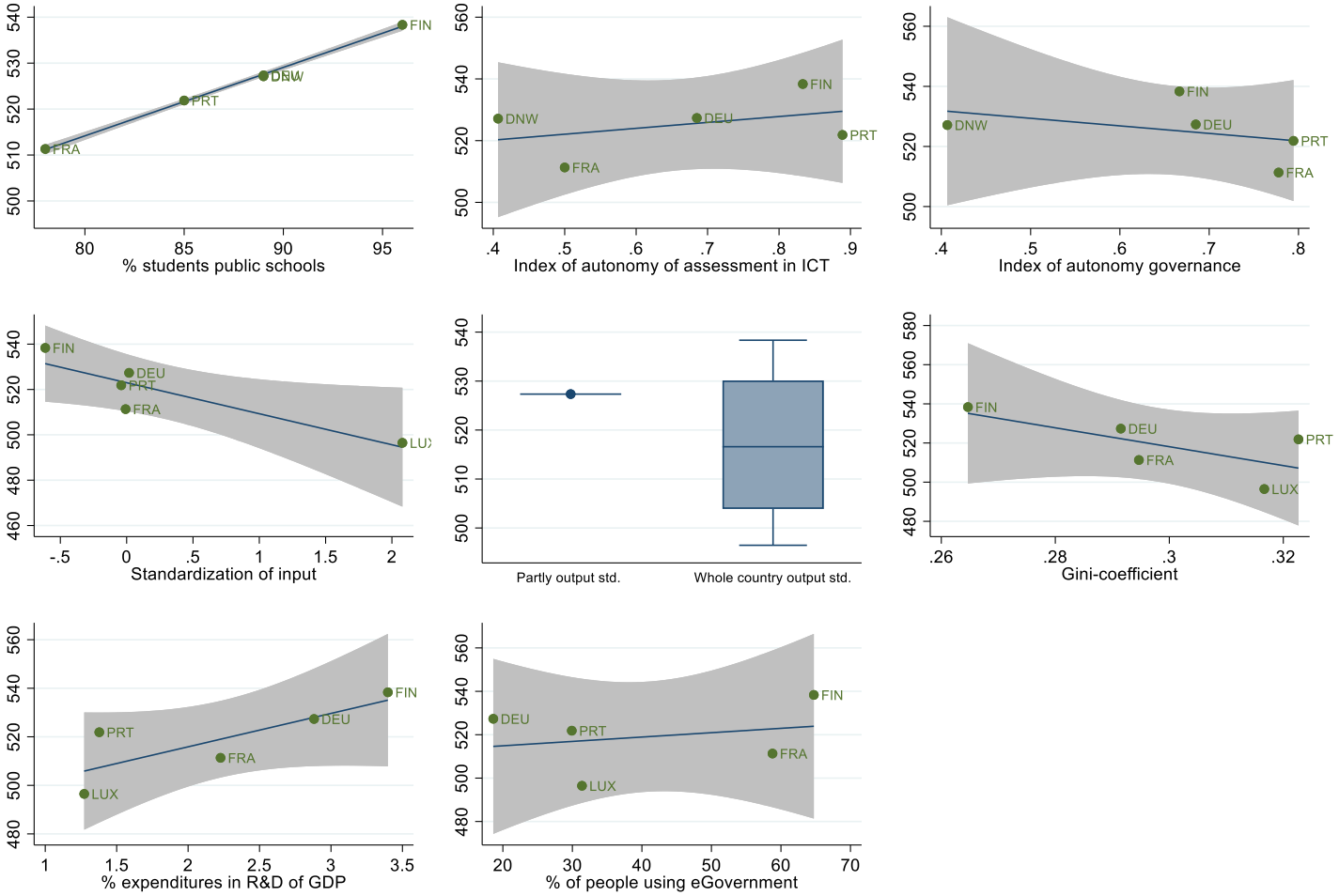
Education systems and skill acquisition

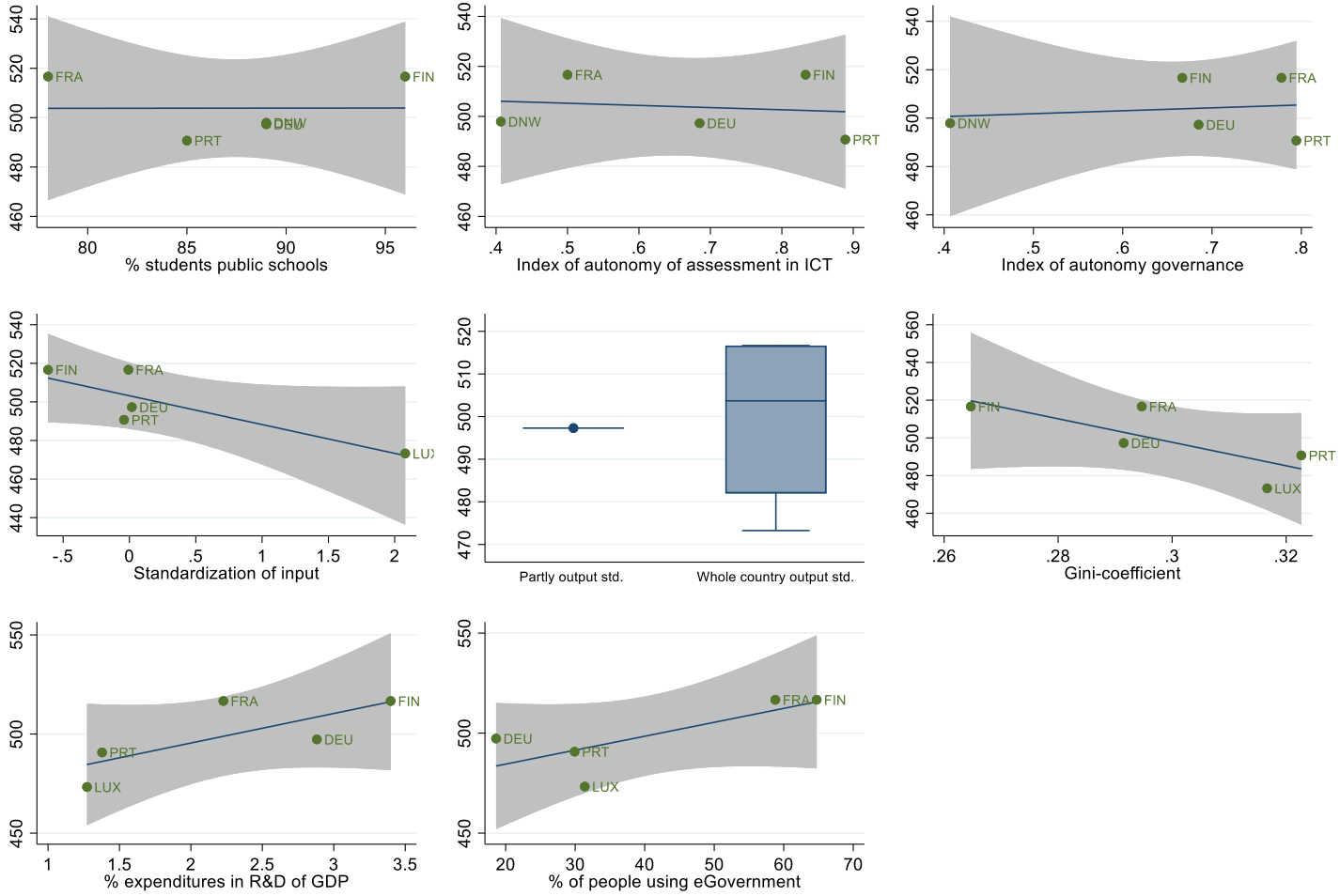
ICILS – CIL



Repetitive weights

Education systems and skill acquisition

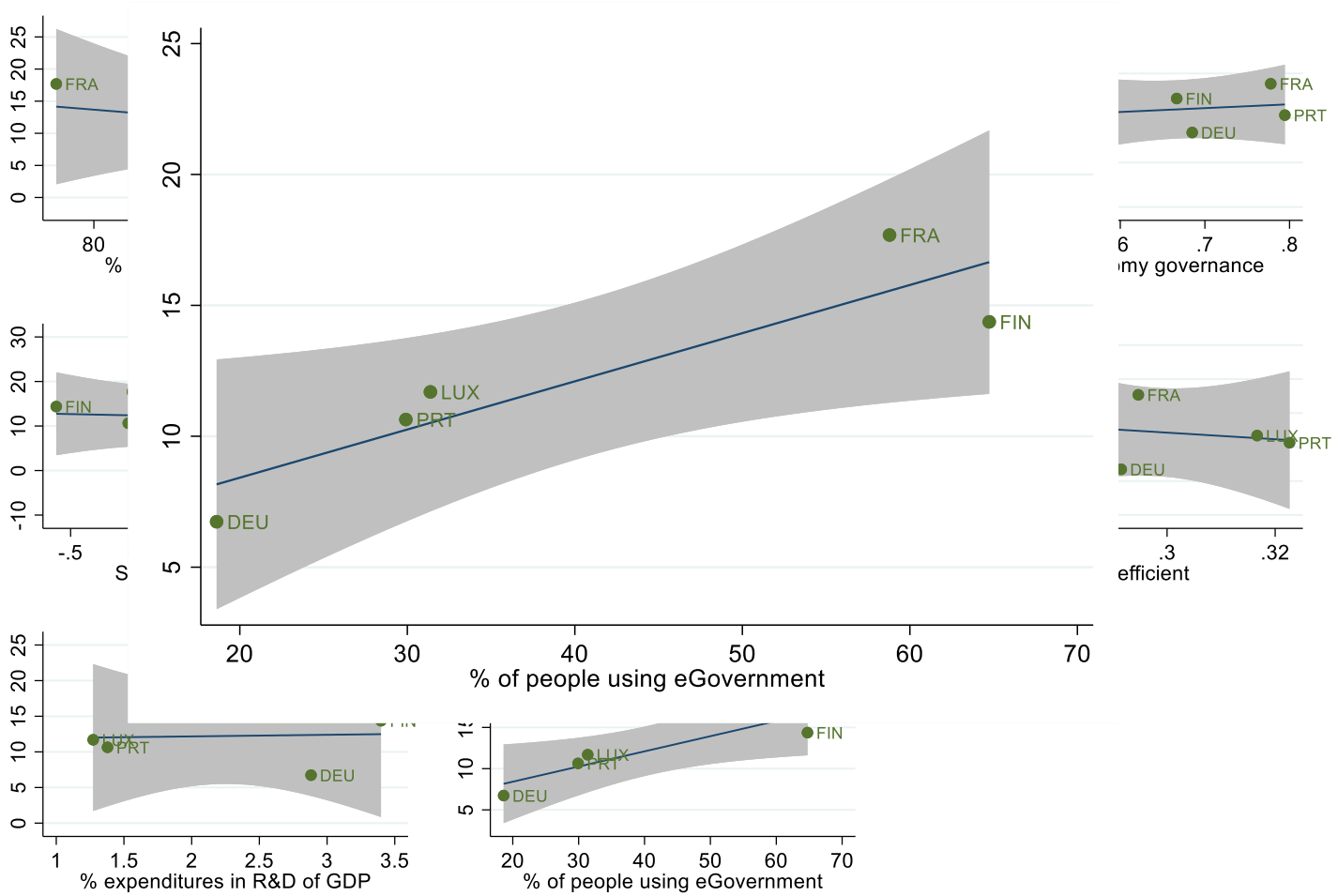
ICILS – CT



Repetitive weights

Inequality in acquisition

ICILS – CIL

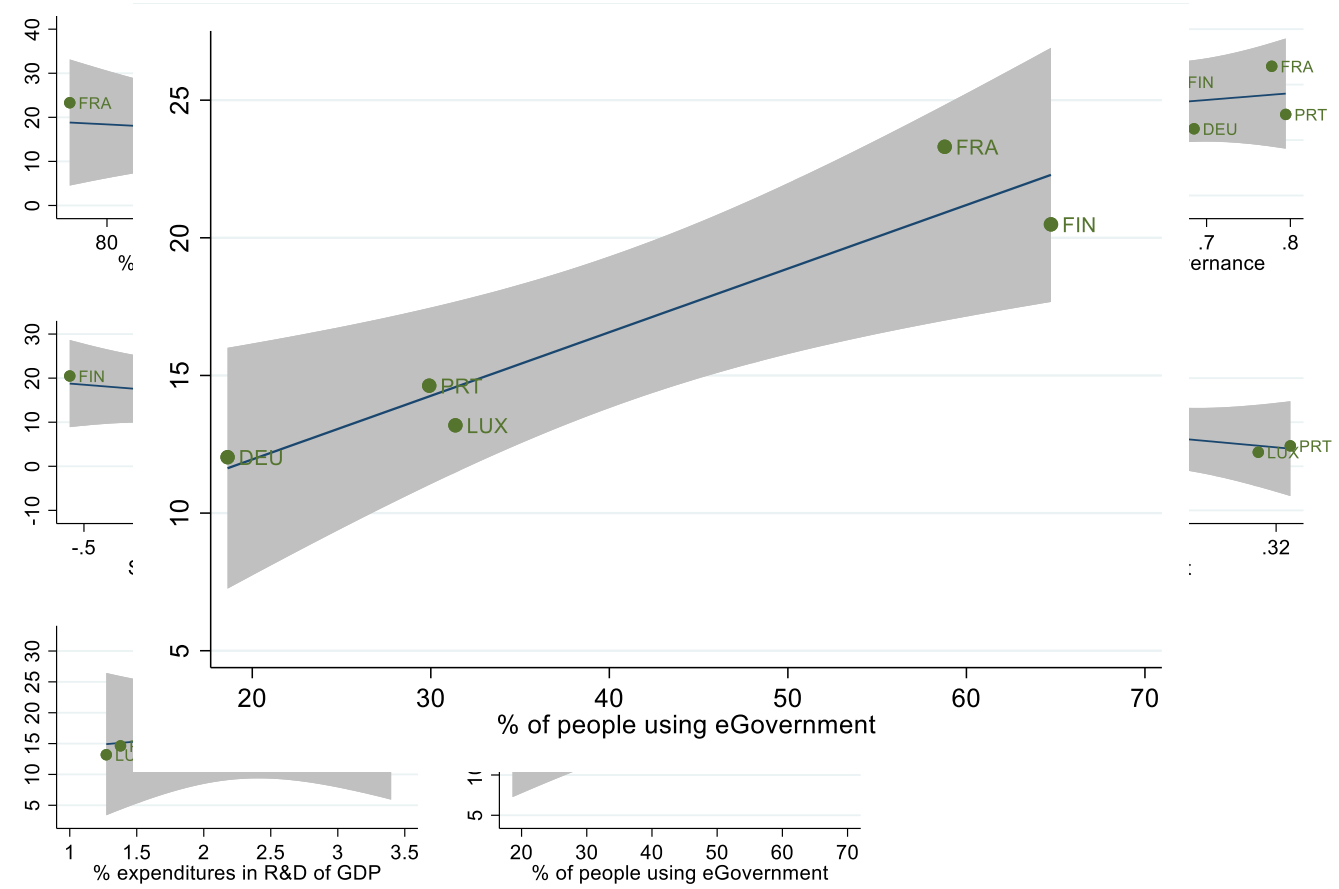


Repetitive weights - Interaction SES

Technequality

Inequality in acquisition

ICILS – CT



Repetitive weights - Interaction SES

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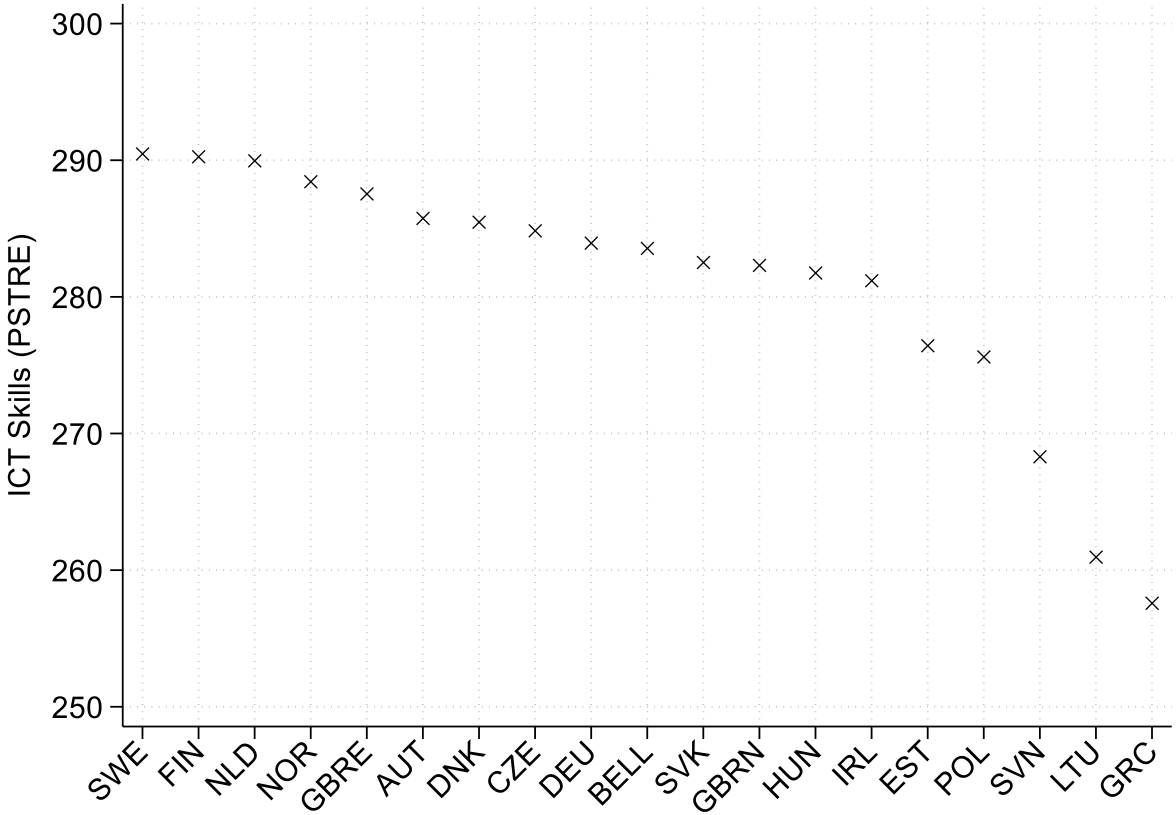
Acquisition of skills

ICT Skills (PSTRE) among working adults (PIAAC)



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Education systems and skill acquisition

PIAAC – ICT Skills (PSTRE)

	(2)	(3)
Gender (=1 Female)	-3.246***	-2.596***
	(0.631)	(0.623)
Age	-0.505***	-0.606***
	(0.147)	(0.157)
Age squared	-0.000449	0.000744
	(0.00180)	(0.00190)
Upper secondary (ISCED 3A-B, C long)	1.579	0.607
	(1.451)	(1.425)
Post-secondary, non-tertiary (ISCED 4A-B-C)	2.476	0.580
	(2.031)	(1.885)
Tertiary (ISCED 5/6)	4.314***	0.412
	(1.288)	(1.244)
At least one parent has attained secondary and post-secondary, non-tertiary	2.374**	1.705*
	(0.804)	(0.789)
At least one parent has attained tertiary	4.021***	2.582**
	(1.086)	(0.958)
Parental education: Don't know	1.671	1.562
	(1.778)	(1.773)
Migration status (= 1 migrants)	-1.243	-1.413
	(1.468)	(1.654)
Literacy scale score - Posterior mean	0.778***	0.737***
	(0.0156)	(0.0170)
FNF AET in 12 months preceding survey (Yes)	2.980***	1.256
	(0.691)	(0.694)
FNF AET in 12 months preceding survey (Still in formal initial education)	4.639**	3.155
	(1.707)	(1.912)
Factor score ICT use daily life		4.833***
		(0.741)
Factor score ICT use at work		3.537***
		(0.392)

	(5)	(7)	(9)	(11)	(13)	(15)	(17)
ICT infrastructure (standardized index)	4.880**						
	(1.557)						
Governmental and private ICT services (standardized index; usage)		-0.0816					
		(0.147)					
Adult education: % participate in adult learning			0.139*				
			(0.0662)				
Technical skills demand 1: Average index of shortage of engineering and technology knowledge and technical skills at the labour market				3.684			
				(8.637)			
Technical skills demand 2: quantiles of working in the high- and medium-high technology manufacturing and knowledge-intensive services					0.291		
					(0.747)		
Technical skills demand 3: % of ICT goods of all the country's import						0.0848	
						(0.607)	
Gender inequality index							-16.77
							(21.27)
cons	73.01***	74.67***	66.15***	72.16***	71.40***	71.58***	74.22***
	(5.475)	(7.402)	(7.335)	(5.801)	(6.610)	(8.540)	(5.764)

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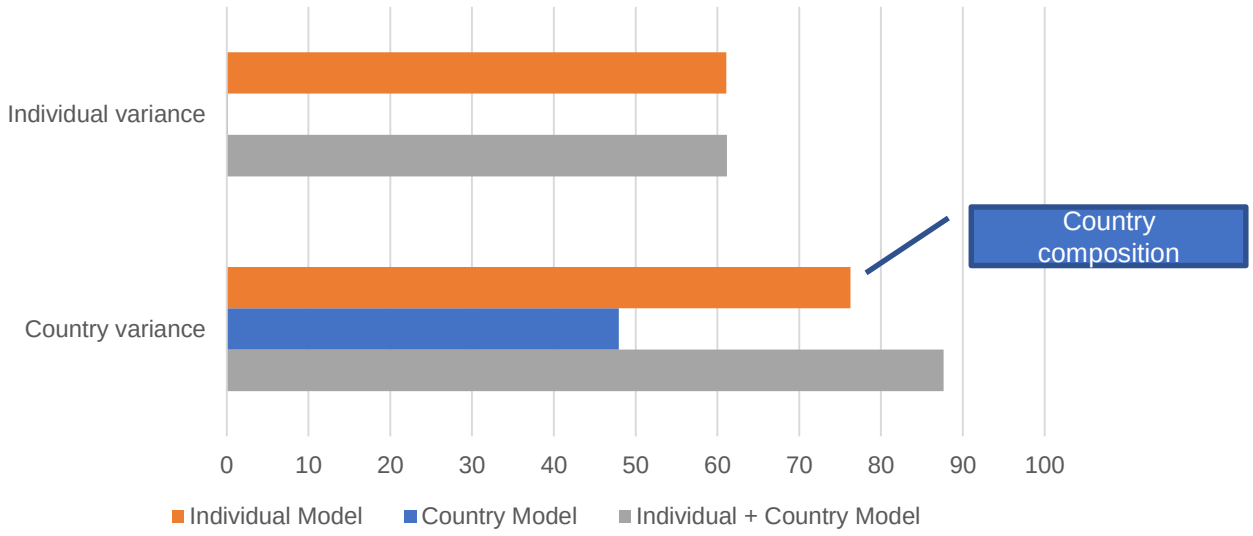
Education systems and skill acquisition

PIAAC – ICT Skills (PSTRE)

- ICC country: 0.047
- Mostly composition effects explain, then system characteristics



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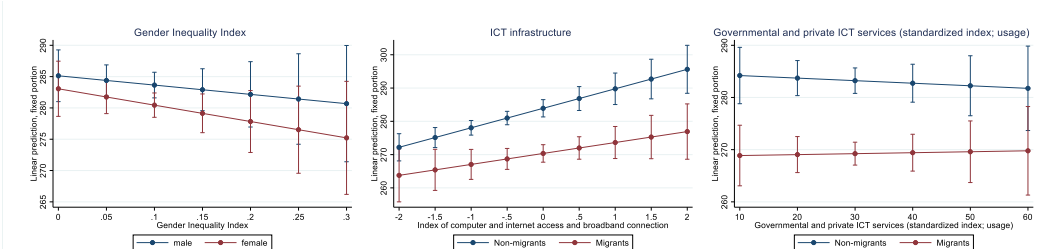
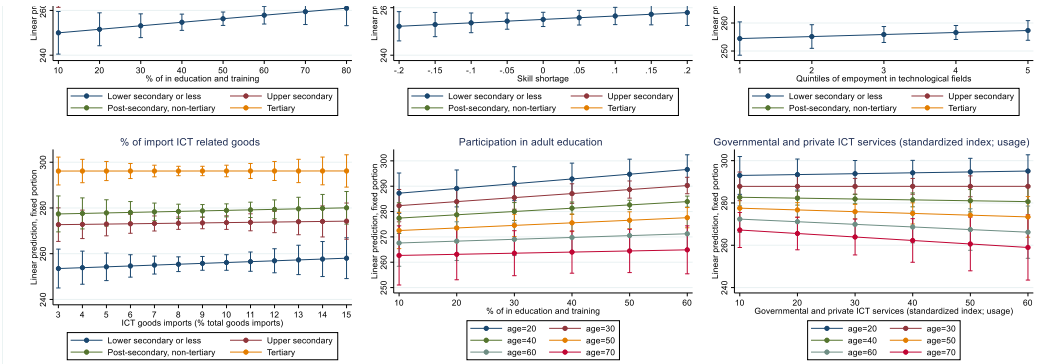
Inequality in acquisition

PIAAC – ICT Skills (PSTRE)



Parallel lines.
No interaction effects are found.



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Conclusion

- PISA
  - Standardisation of input
  - How does one learn in a country varies by sex and SES
- ICILS
  - Differences across countries are sizeable
  - Little cross-country possibilities

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Conclusion

- PIAAC
  - Story of prerequisites
    - For ICT skills do relate highly to the individual use of ICT, the technical conditions and literacy
    - But not necessarily about gaps by gender and socio-economic status

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Thank you for listening!

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Appendix

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Definitions

PISA – problem solving

"Involves initiating, usually on the basis of hunches or feelings, experimental interactions with the environment to clarify the nature of a problem and potential solutions", so that the problem-solver "can learn more […] about the nature of the problem and the effectiveness of their strategies", "modify their behaviour and launch a further round of experimental interactions with the environment" (Raven, 2000, p. 54, as cited in OECD, 2013).

ICILS – CIL and CT

CIL is "an individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society" (Fraillon et al. 2013, p. 17).

Fraillon et al. (2019, p. 27) defined CT as "an individual's ability to recognize aspects of real-world problems which are appropriate for computational formulation and to evaluate and develop algorithmic solutions to those problems so that the solutions could be operationalized with a computer."

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Definitions

PIAAC – ICT skills (PSTRE)

Problem solving skills in a technology-rich environment (PSTRE) – or ICT skills – that is the ability to use information and communication technologies "using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks" (OECD, 2019)

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