DIGITAL COMPETENCES AMONG FIRST- AND SECOND-GENERATION MIGRANT STUDENTS IN ITALY

Evidence from INVALSI Data

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Introduction

Literature on digital inequality and the digital divide.

1. Digital Competence Framework for Citizens (DigComp)

2. Digital skills on the European Policy Agenda

3. Digital Education Action Plan

4. OECD analysis on PISA

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Literature on digital inequality and the digital divide: DigComp 2.2.



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Literature on digital inequality and the digital divide.

Analysis of students with a migrant background

1. socio-economic background

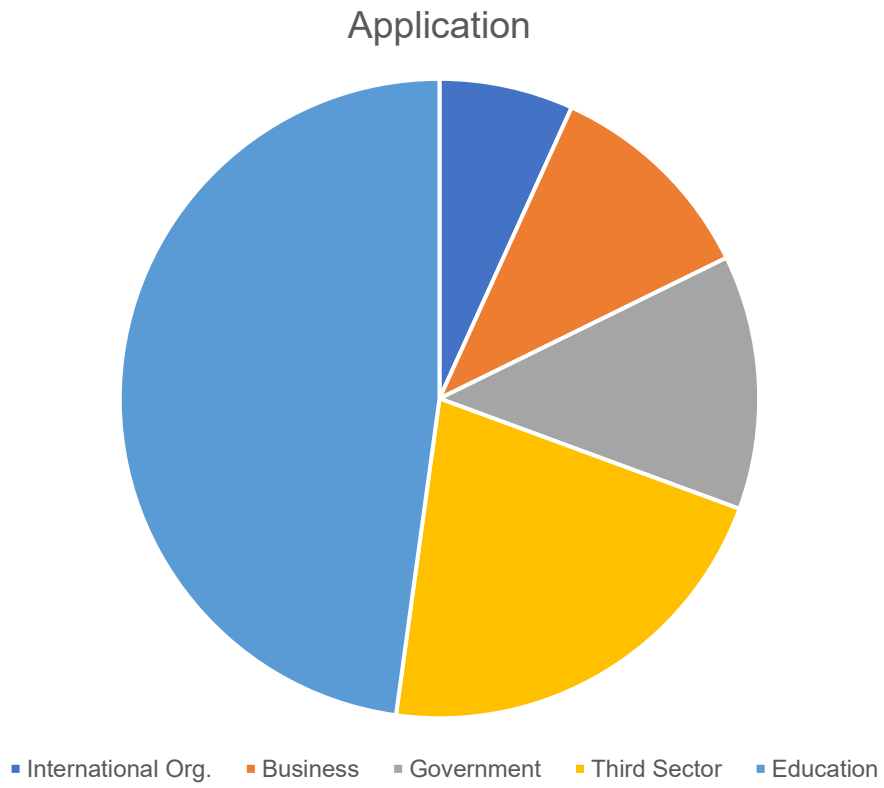
2. language barriers

3. school segregation

4. unequal access to learning opportunities

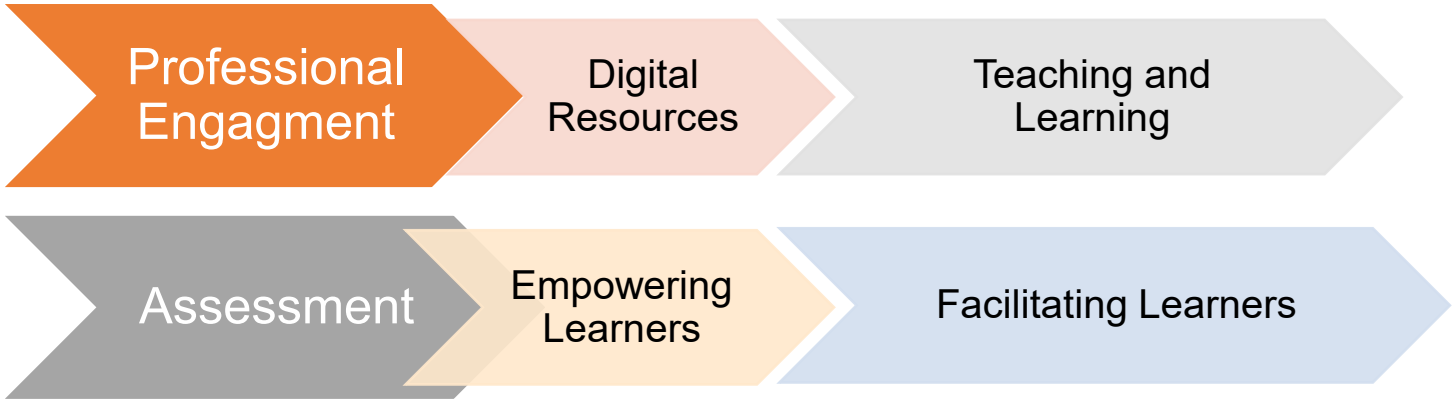
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Literature on digital inequality and the digital divide.



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Literature on digital inequality and the digital divide.





Theoretical framework and research questions

DigComp 2.2

Digital competence comprises information, communication, content creation and safe, responsible technology use.

Second-level divide

Access alone does not eliminate inequality: effective skills and outcomes remain socially structured.

Migrant generations

First- and second-generation students may have distinct educational and digital profiles.

Do migrant-origin gaps persist after controlling for ESCS, school track and territory?

Contribution

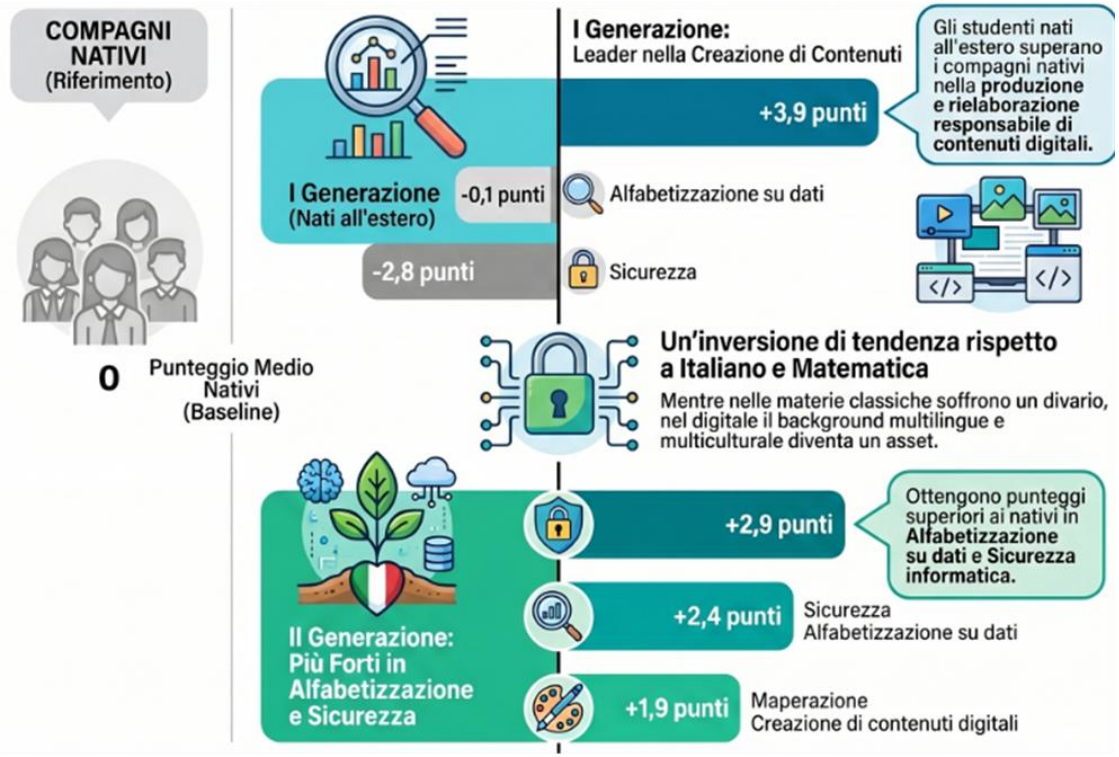
The study links digital inequality, migrant background and educational stratification using four domain-specific outcomes.

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Research goal:

1. Inequalities in digital competences
2. Main individual (gender)
3. Family (socio-economic and cultural background)
4. Territorial factors (geographical area and type of upper-secondary school)

INVALSI 2025 highlights specific digital strengths



First generation
+3.9 in Content creation; −0.1 in Information & data; −2.8 in Safety

Second generation
+2.4 in Information & data; +2.9 in Safety; +1.9 in Content creation.

Source: https://www.invalsi.it/allievi-stranieri-prove-invalsi-2025/

CORE FINDING

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The persistent hierarchy is generational

NATIVE STUDENTS

Reference group

SECOND GENERATION

Closer to natives

FIRST GENERATION

Largest residual gaps

Across both school years, first-generation students show the largest disadvantages. Second-generation students are generally closer to native peers, but convergence is incomplete and domain-specific.

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INVALSI GRADE 10, 2024/25

Data and completed empirical strategy

Sample

19,020 students in origin-only models; 16,689 complete cases in adjusted models.

Outcomes

WLE Rasch scores for Information & data, Communication & collaboration, Content creation and Safety.

Inference

Student weights; robust standard errors clustered by school.

Weighted OLS models are estimated for continuous WLE scores; ordered logits model the three proficiency levels.

Nested models

M1: origin. M2: + sex, ESCS, progression. M3: + school track and macro-area. M4: + Italian grade.

Main specification

Model 3 is used for interpretation because it captures individual, institutional and territorial stratification.

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Migrant-origin gaps 2024/2025

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
VARIABLES	Information and data- M1	Information and data- M2	Information and data- M3	Information and data- M4	Communication and collaboration- M1	Communication and collaboration- M2	Communication and collaboration- M3	Communication and collaboration- M4	Content Creation –M1	Content Creation –M2	Content creation- M3	Content creation- M4	Safety - M1	Safety - M2	Safety - M3	Safety -M4
I generation	-14.933***	-7.676***	-8.916***	-8.922***	-15.905***	-9.676***	-10.827***	-10.835***	-10.964***	-3.971	-4.879**	-4.880**	-10.817***	-3.481	-4.242	-4.248
	(2.136)	(2.652)	(2.392)	(2.385)	(2.641)	(2.677)	(2.375)	(2.369)	(2.343)	(2.533)	(2.351)	(2.350)	(2.655)	(2.981)	(2.749)	(2.746)
II generation	-3.080**	1.274	-2.463*	-2.459*	-3.479***	0.020	-3.574***	-3.569***	-3.218**	1.073	-1.893	-1.892	-3.490**	0.563	-2.399*	-2.395*
	(1.354)	(1.517)	(1.428)	(1.432)	(1.331)	(1.403)	(1.357)	(1.361)	(1.311)	(1.450)	(1.331)	(1.331)	(1.359)	(1.478)	(1.309)	(1.307)
Missing	-19.855***	-19.518***	-16.534***	-16.525***	-19.398***	-22.619***	-19.940***	-19.929***	-20.635***	-22.417***	-19.554***	-19.553***	-20.313***	-21.234***	-17.963***	-17.954***
	(2.627)	(4.215)	(3.883)	(3.877)	(2.591)	(4.395)	(4.143)	(4.141)	(2.936)	(4.852)	(4.527)	(4.527)	(2.234)	(3.652)	(3.378)	(3.383)
Female		-1.400	-2.796***	-2.802***		3.384***	2.490***	2.483***		-1.574*	-2.788***	-2.789***		-4.286***	-5.203***	-5.209***
		(0.908)	(0.840)	(0.839)		(0.888)	(0.821)	(0.818)		(0.865)	(0.833)	(0.831)		(0.843)	(0.835)	(0.833)
ESCS_student		4.706***	1.244***	1.242***		4.211***	1.272***	1.270***		4.373***	1.328***	1.328***		4.310***	1.306***	1.304***
		(0.465)	(0.399)	(0.400)		(0.465)	(0.435)	(0.435)		(0.468)	(0.395)	(0.395)		(0.493)	(0.409)	(0.409)
regolarity = Postponed		-7.609***	-4.550***	-4.537***		-5.092***	-2.513**	-2.496**		-7.643***	-4.740***	-4.738***		-6.842***	-3.843***	-3.830***
		(1.300)	(1.202)	(1.200)		(1.344)	(1.240)	(1.239)		(1.379)	(1.309)	(1.311)		(1.471)	(1.376)	(1.376)
Other High Schools			-9.102***	-9.102***			-7.509***	-7.509***			-8.112***	-8.112***			-8.492***	-8.492***
			(1.278)	(1.280)			(1.182)	(1.186)			(1.171)	(1.172)			(1.316)	(1.320)
Technical Institutes			-10.745***	-10.770***			-7.597***	-7.628***			-9.322***	-9.326***			-8.314***	-8.339***
			(1.137)	(1.134)			(1.212)	(1.203)			(1.193)	(1.188)			(1.230)	(1.224)
Professional Institutes			-26.453***	-26.502***			-23.274***	-23.336***			-24.069***	-24.077***			-24.643***	-24.692***
			(1.767)	(1.775)			(1.845)	(1.850)			(1.923)	(1.929)			(1.955)	(1.964)
North East			-0.561	-0.475			-1.739	-1.633			-2.500*	-2.487*			-0.414	-0.329
			(1.361)	(1.376)			(1.210)	(1.213)			(1.331)	(1.330)			(1.417)	(1.429)
Center			-8.209***	-8.186***			-7.235***	-7.207***			-8.729***	-8.725***			-8.056***	-8.033***
			(1.392)	(1.397)			(1.500)	(1.496)			(1.404)	(1.406)			(1.508)	(1.510)
South			-14.055***	-13.947***			-13.179***	-13.045***			-13.281***	-13.264***			-11.644***	-11.538***
			(1.423)	(1.430)			(1.442)	(1.435)			(1.515)	(1.511)			(1.552)	(1.557)
South and Islands			-15.900***	-15.973***			-14.922***	-15.013***			-12.703***	-12.714***			-11.832***	-11.904***
			(1.435)	(1.429)			(1.342)	(1.348)			(1.478)	(1.486)			(1.590)	(1.578)
Average italian evaluation				0.011				0.013				0.002				0.011
				(0.014)				(0.014)				(0.015)				(0.016)
Constant	201.190***	203.106***	219.330***	219.135***	201.242***	200.220***	214.283***	214.041***	201.104***	202.842***	217.798***	217.767***	201.116***	204.123***	217.725***	217.532***
	(0.762)	(0.926)	(1.325)	(1.355)	(0.700)	(0.890)	(1.265)	(1.294)	(0.729)	(0.913)	(1.290)	(1.335)	(0.712)	(0.885)	(1.296)	(1.351)

MAIN RESULTS: MODEL 3

Migrant-origin gaps

First generation

Information & data −8.92***;
Communication −10.83***;
Content creation −4.88**;
Safety −4.24.

Second generation

Information & data −2.46*;
Communication −3.57***;
Content creation −1.89;
Safety −2.40*.

Interpretation

First-generation disadvantage is broader and larger; second-generation gaps are smaller and domain-specific.

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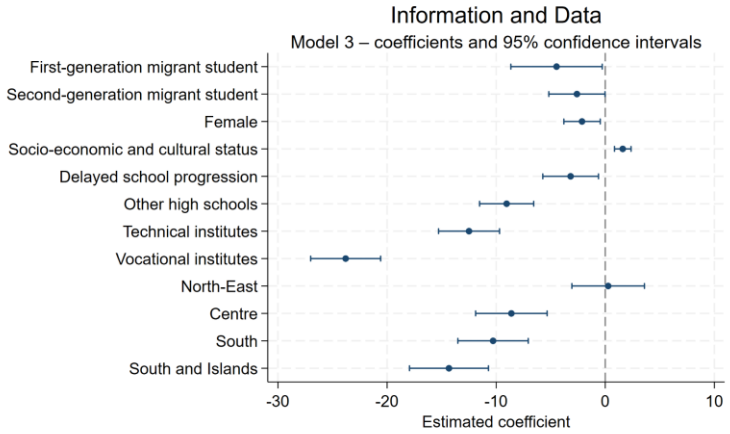
Migrant-origin gaps 2025/2026

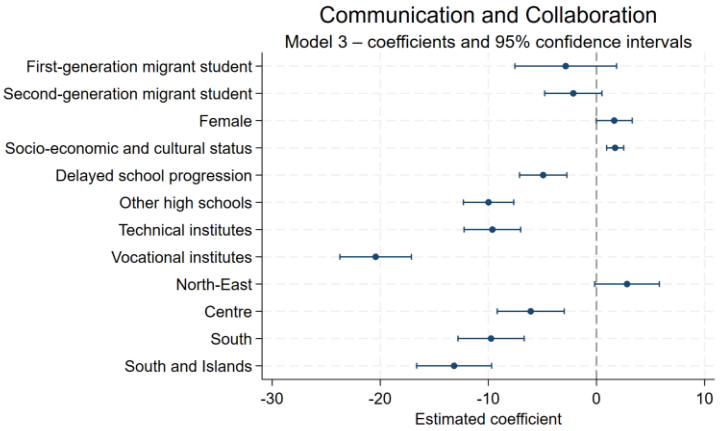
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VARIABLES	Information and data- M1	Information and data- M2	Information and data- M3	Information and data- M4	Communication and collaboration- M1	Communication and collaboration- M2	Communication and collaboration- M3	Communication and collaboration- M4	Content Creation – M1	Content Creation – M2	Content creation- M3	Content creation- M4	Safety - M1	Safety - M2	Safety - M3	Safety - M4
Origin indicator = 2, Foreign I generation	-8.287***	-3.469	-4.465**	-0.020	-7.320***	-1.384	-2.846	9.707	-7.629***	-0.989	-1.870	5.005	-9.140***	-3.785	-4.904*	1.364
	(2.128)	(2.283)	(2.131)	(5.871)	(2.317)	(2.516)	(2.393)	(6.087)	(2.097)	(2.335)	(2.239)	(6.074)	(2.548)	(2.862)	(2.801)	(7.436)
Origin indicator = 3, Foreigner II generation	-4.470***	-0.094	-2.595**	-0.173	-4.091***	0.880	-2.144	4.305	-2.092	2.910**	0.701	6.167	-4.549***	-0.861	-3.341**	-5.919*
	(1.398)	(1.426)	(1.312)	(2.978)	(1.338)	(1.405)	(1.348)	(3.288)	(1.414)	(1.463)	(1.420)	(4.057)	(1.450)	(1.579)	(1.463)	(3.206)
Student Gender = 2, Female		-0.367	-2.129**	-4.806**		2.499***	1.643*	-1.469		-2.586***	-3.713***	-8.998***		-3.626***	-4.549***	-4.561**
		(0.918)	(0.849)	(1.863)		(0.899)	(0.846)	(1.905)		(0.931)	(0.883)	(2.023)		(0.932)	(0.857)	(1.871)
Socio-economic-cultural background of the student		4.936***	1.603***	1.350*		4.626***	1.725***	1.768**		4.641***	2.150***	3.133***		4.376***	1.745***	1.100
		(0.456)	(0.386)	(0.686)		(0.450)	(0.401)	(0.885)		(0.469)	(0.414)	(0.892)		(0.428)	(0.383)	(0.748)
Indicator of regularity with respect to studies = 3, Postponed		-6.319***	-3.175**	6.829**		-7.390***	-4.931***	-4.628*		-7.302***	-4.797***	0.414		-4.590***	-2.100	1.889
		(1.335)	(1.300)	(2.983)		(1.167)	(1.113)	(2.772)		(1.334)	(1.318)	(3.116)		(1.413)	(1.416)	(2.740)
Type of Institute = 2, Other High Schools			-9.041***	-6.048***			-9.985***	-3.806*			-6.861***	0.774			-7.646***	-5.437**
			(1.263)	(2.158)			(1.186)	(2.224)			(1.440)	(2.646)			(1.280)	(2.192)
Type of Institute = 3, Technical Institutes			-12.488***	-14.244***			-9.629***	-9.793***			-8.165***	-6.681**			-8.235***	-12.708***
			(1.423)	(2.853)			(1.332)	(2.991)			(1.481)	(3.040)			(1.342)	(3.073)
Type of Institute = 4, Professional Institutes			-23.795***	-29.593***			-20.427***	-21.827***			-19.091***	-20.348***			-19.563***	-20.210***
			(1.632)	(3.302)			(1.684)	(3.991)			(1.745)	(3.498)			(1.553)	(3.725)
Region = 2, North East			0.267	2.899			2.826*	7.132*			2.093	2.400			-0.777	3.470
			(1.693)	(5.570)			(1.522)	(3.921)			(1.743)	(4.015)			(1.530)	(4.188)
Region = 3, Center			-8.607***	-2.068			-6.083***	3.385			-7.264***	-2.953			-7.050***	-1.095
			(1.668)	(3.364)			(1.578)	(4.239)			(1.854)	(3.840)			(1.550)	(4.171)
Region = 4, South			-10.284***	-1.627			-9.750***	-0.493			-7.032***	0.541			-9.064***	-3.294
			(1.641)	(3.121)			(1.560)	(3.944)			(1.680)	(3.482)			(1.539)	(4.150)
Region = 5, South and Islands			-14.326***	-5.922*			-13.171***	-4.232			-12.086***	-6.111*			-14.065***	-9.065**
			(1.842)	(3.255)			(1.763)	(3.841)			(1.768)	(3.534)			(1.750)	(4.121)
Average italian teacher evaluation				5.807***				6.289***				6.987***				5.455***
				(0.623)				(0.734)				(0.765)				(0.577)
Constant	200.121***	201.944***	217.232***	172.346***	201.063***	200.674***	213.204***	163.213***	199.781***	201.965***	213.015***	162.633***	200.607***	203.682***	216.138***	175.888***
	(0.792)	(0.885)	(1.583)	(5.135)	(0.725)	(0.828)	(1.430)	(6.559)	(0.774)	(0.918)	(1.546)	(6.910)	(0.707)	(0.846)	(1.435)	(5.225)

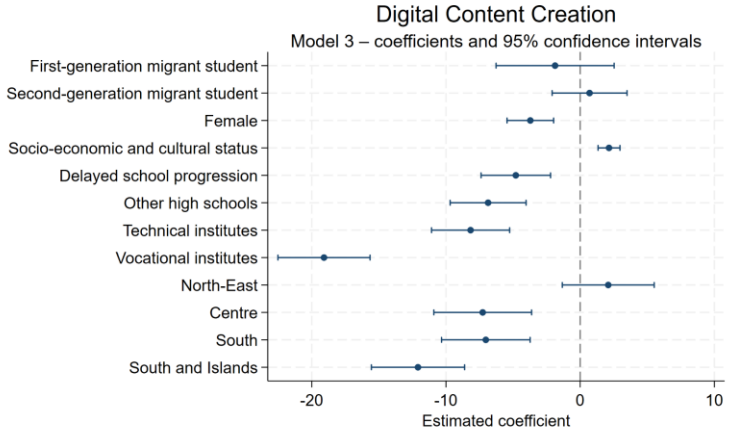
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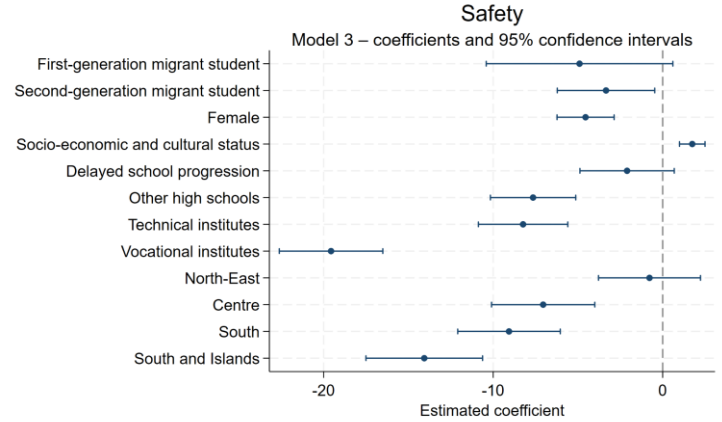
OLS MODEL

2025/26: smaller and more domain-specific gaps









First generation: the clearest disadvantage is in Information & data.
Second generation: smaller gaps, with evidence concentrated in Information & data and Safety.

OTHER DETERMINANTS

Migration background operates within wider gaps

SCHOOL TRACK

The largest gaps are associated with vocational institutes across all domains.

TERRITORY

A persistent North–South gradient culminates in the South and Islands.

SOCIO-ECONOMIC STATUS

Higher ESCS is positively associated with every digital-skill domain.

SCHOOL PROGRESSION

Delayed progression is generally associated with lower scores.

Migrant background operates within a wider structure of educational inequality.

What changes in the latest school year?

Persistent result

First-generation students remain the group with the largest disadvantages, especially in Information & data and Safety.

Narrower 2025/26 gaps

Communication and Content creation differences weaken substantially in both continuous and ordered outcomes.

Second generation

Differences remain smaller than for first generation; the latest evidence concentrates on Information & data and Safety.

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WHAT THE FINDINGS MEAN

Discussion and policy implications

Separate generations

First- and second-generation students should not be treated as a homogeneous category.
First-generation students show the most persistent disadvantages.

Keep domains separate

Communication, information, content creation and safety reveal distinct patterns.

Target structural gaps

Vocational pathways and disadvantaged territories require explicit attention.

Digital competence is both an educational outcome and an indicator of opportunity.

Priority actions:

- language-sensitive digital support for first-generation students;
- strengthened digital curricula in vocational education;
- territorially targeted resources;
- monitoring by domain rather than through one composite score.

Messages to take away

Conclusion

First-generation students retain significant adjusted gaps in three domains. Second-generation gaps are smaller and less uniform.

Contribution

The analysis connects migrant-origin inequality to socio-economic, school-track and territorial stratification.

Limitations

Cross-sectional coefficients are not causal;
migration histories and school digital resources are not observed.

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Thanks for your attention!

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