



Open Research using INVALSI data and multilevel models

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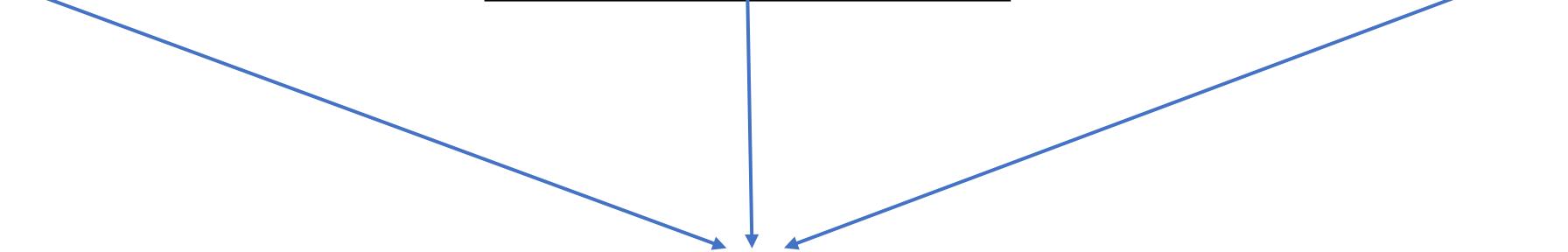
The Open Research Setting

Open Data

Free Computing
Resources

Advanced (but
Accessible) Ana-
lytical Models

Relevant Research Questions





The Open Data

<https://invalsi-serviziostatistico.cineca.it/>

The screenshot shows the INVALSI - SERVIZIO STATISTICO website interface. At the top, there is a header with the INVALSI logo on the left, the title "INVALSI - SERVIZIO STATISTICO" in the center, and another INVALSI logo on the right. Below the header, a navigation bar includes links for "Home", "Area Riservata", "Area Personale", "Login", and "Registrati". On the left, a sidebar titled "Servizio Statistico" lists various menu items such as Home, Dati, Statistiche sugli apprendimenti, Open Data, Sistan, Newsletter, Eventi, Diffusione cultura statistica, Privacy, and Contatti. The main content area displays a table titled "▼ Matrici campione a.s. 2021-22 - data caricamento 06/07/2022 - data aggiornamento 12/12/2022". The table has columns for "a.s.", "Grado", "Materia", "Matrice", and "Tracciato". It lists 14 rows corresponding to different subjects and grades, each with a "CSV" link under the "Matrice" column.

a.s.	Grado	Materia	Matrice	Tracciato
2021-22	2	Italiano	CSV	CSV
2021-22	2	Matematica	CSV	CSV
2021-22	5	Italiano	CSV	CSV
2021-22	5	Matematica	CSV	CSV
2021-22	5	Inglese Listening	CSV	CSV
2021-22	5	Inglese Reading	CSV	CSV
2021-22	8	Italiano	CSV	CSV
2021-22	8	Matematica	CSV	CSV
2021-22	8	Inglese Listening	CSV	CSV
2021-22	8	Inglese Reading	CSV	CSV
2021-22	10	Italiano	CSV	CSV
2021-22	10	Matematica	CSV	CSV
2021-22	13	Italiano	CSV	CSV



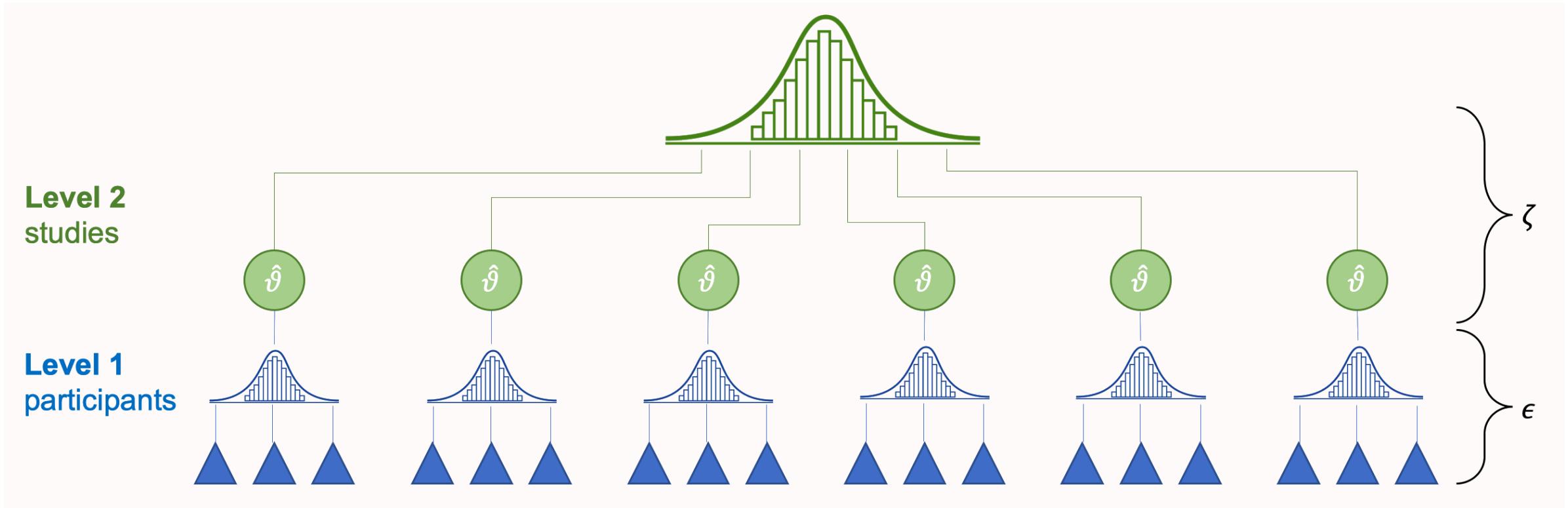
Computational Resources

<https://cran.r-project.org/>



Cutting-edge Modelling Tools

https://github.com/rmcelreath/stat_rethinking_2023





The Motivating Issue

The number and the share of students with an immigrant background attending Italian schools is steadily increasing;

This poses new challenges to the system, for example in terms of ability to transfer knowledge and values;

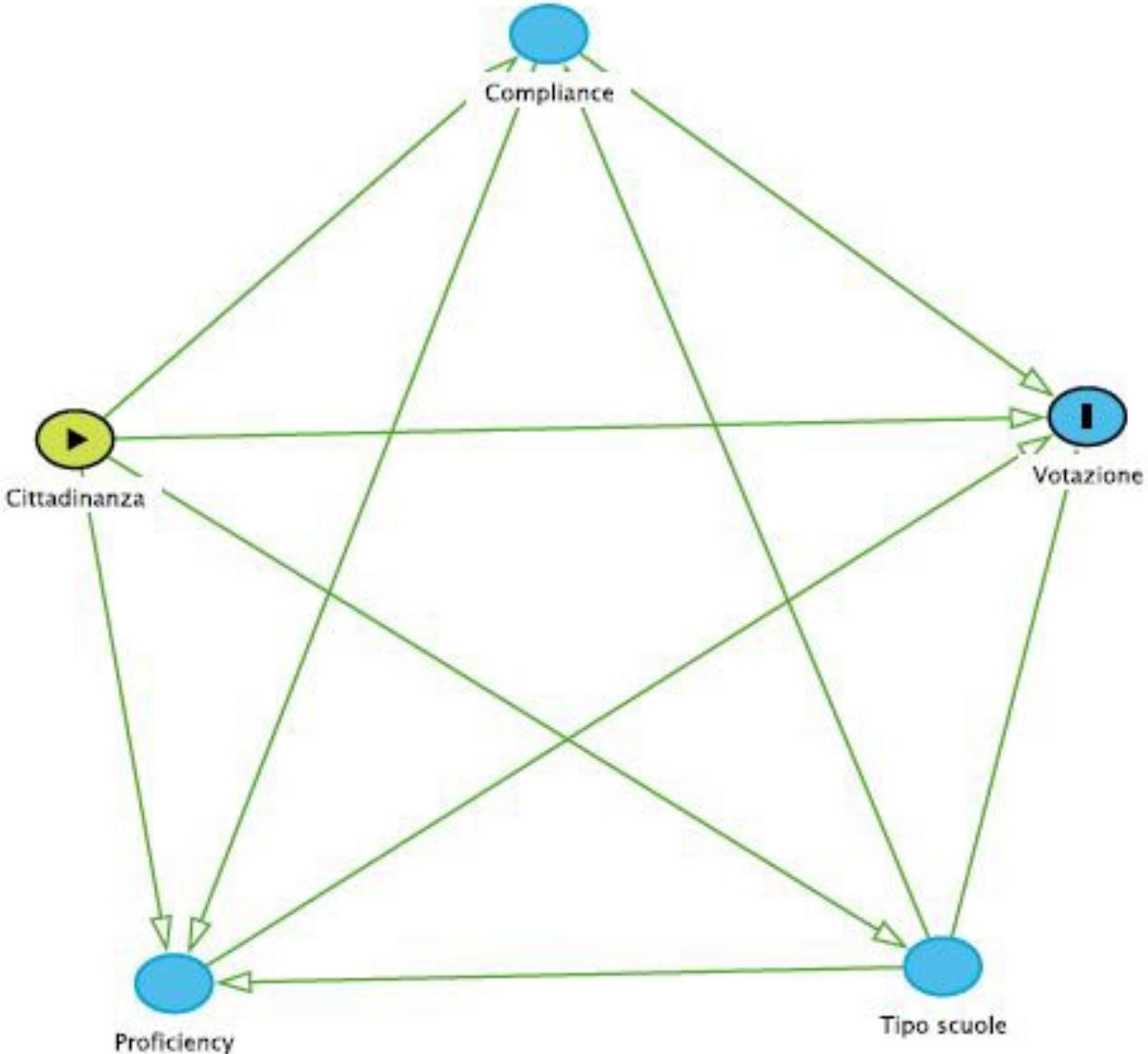
At the same time, schools are the main agencies for integrating foreign students;



The Research Question

- Do the teachers, who are almost entirely Italian, evaluate Italian students and foreign students in the same way?
- And if there are differences in evaluations, do they vary by region or type of school?
- *Case study: Mat marks at grade 13th*

Let's try to act
more formally (and
transparently...)



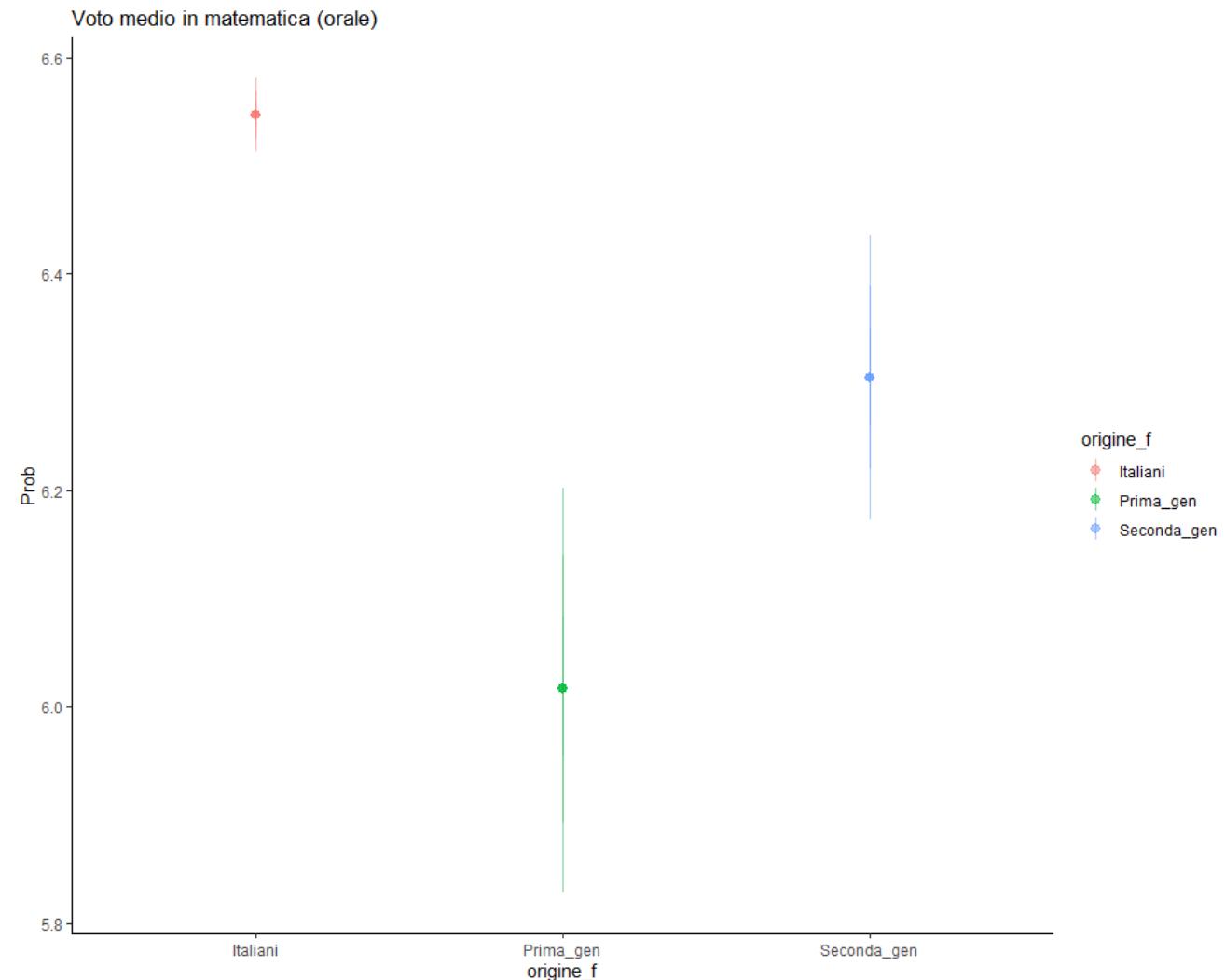
Omitting wrangling...

- Checking missing values;
- Renaming variables;
- Centering/standardizing;
- Creating factors;
- Ecc.



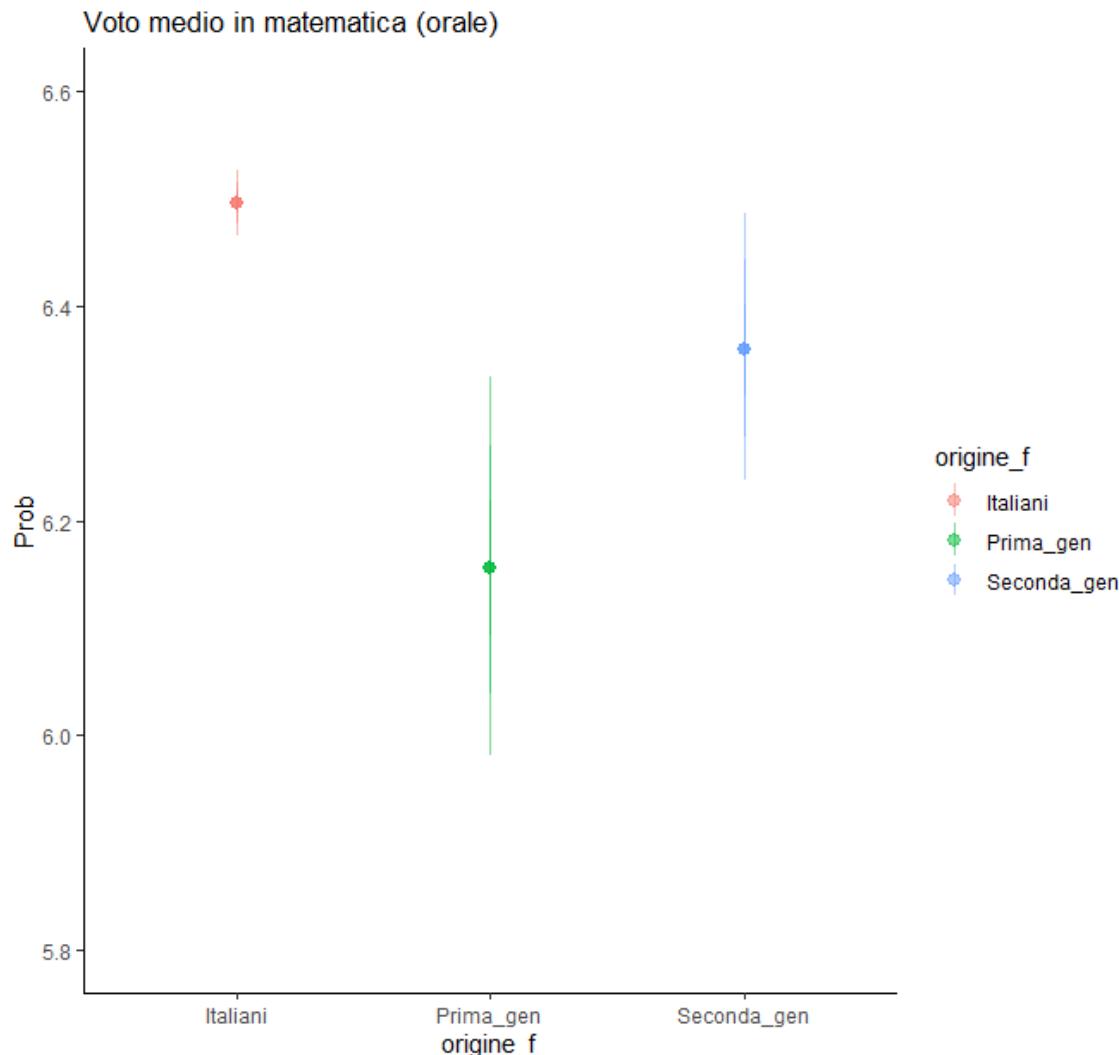
Voto = $b_0 + b_1 * \text{cittadinanza}$

origine_f	median	sd
Italiani	6.55	0.02
Prima_gen	6.02	0.10
Seconda_gen	6.30	0.07

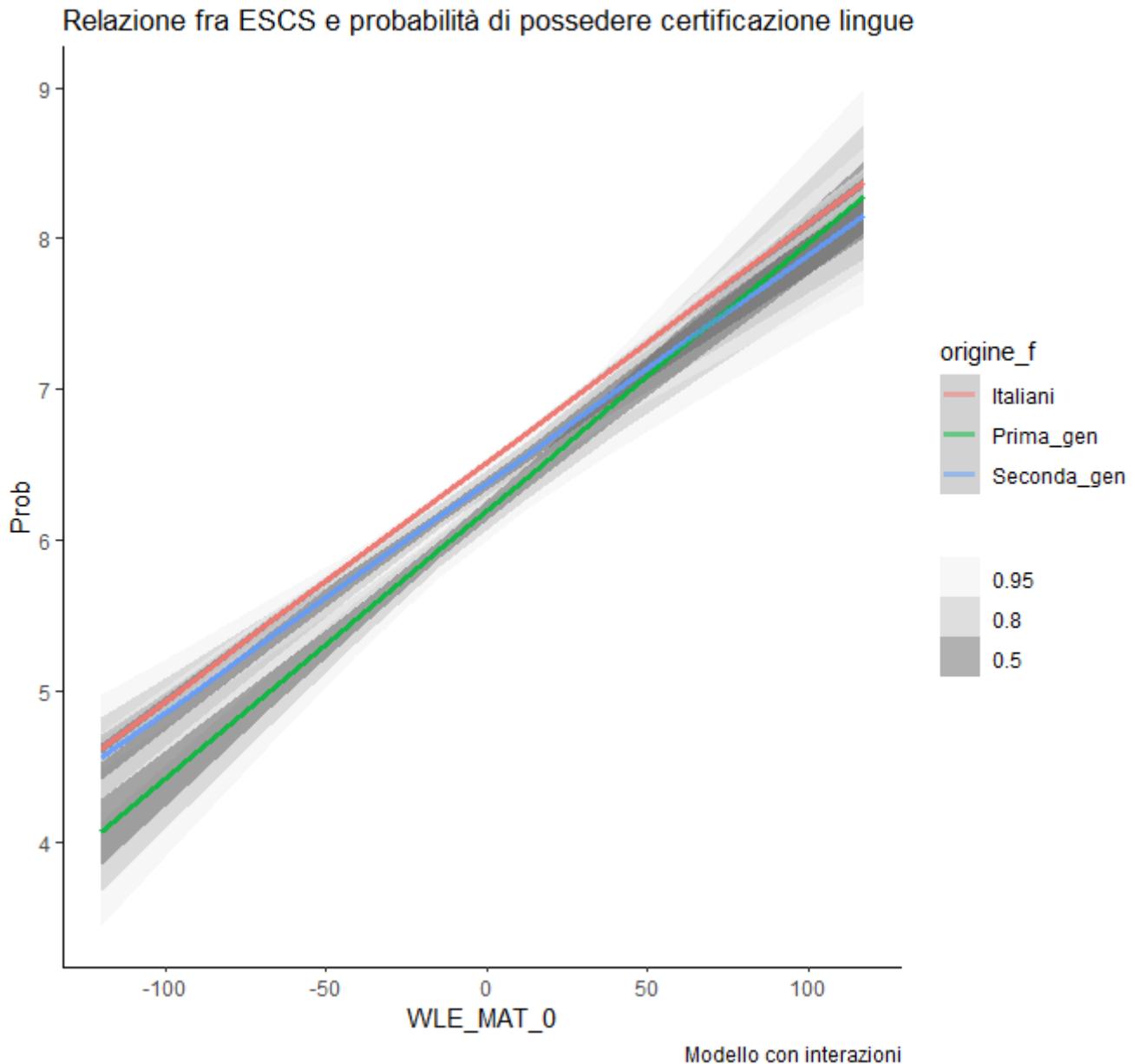


$Voto = b_0 + b_1*cittadinanza + b_2*inv_score + b_3*cittadinanza:inv_score$

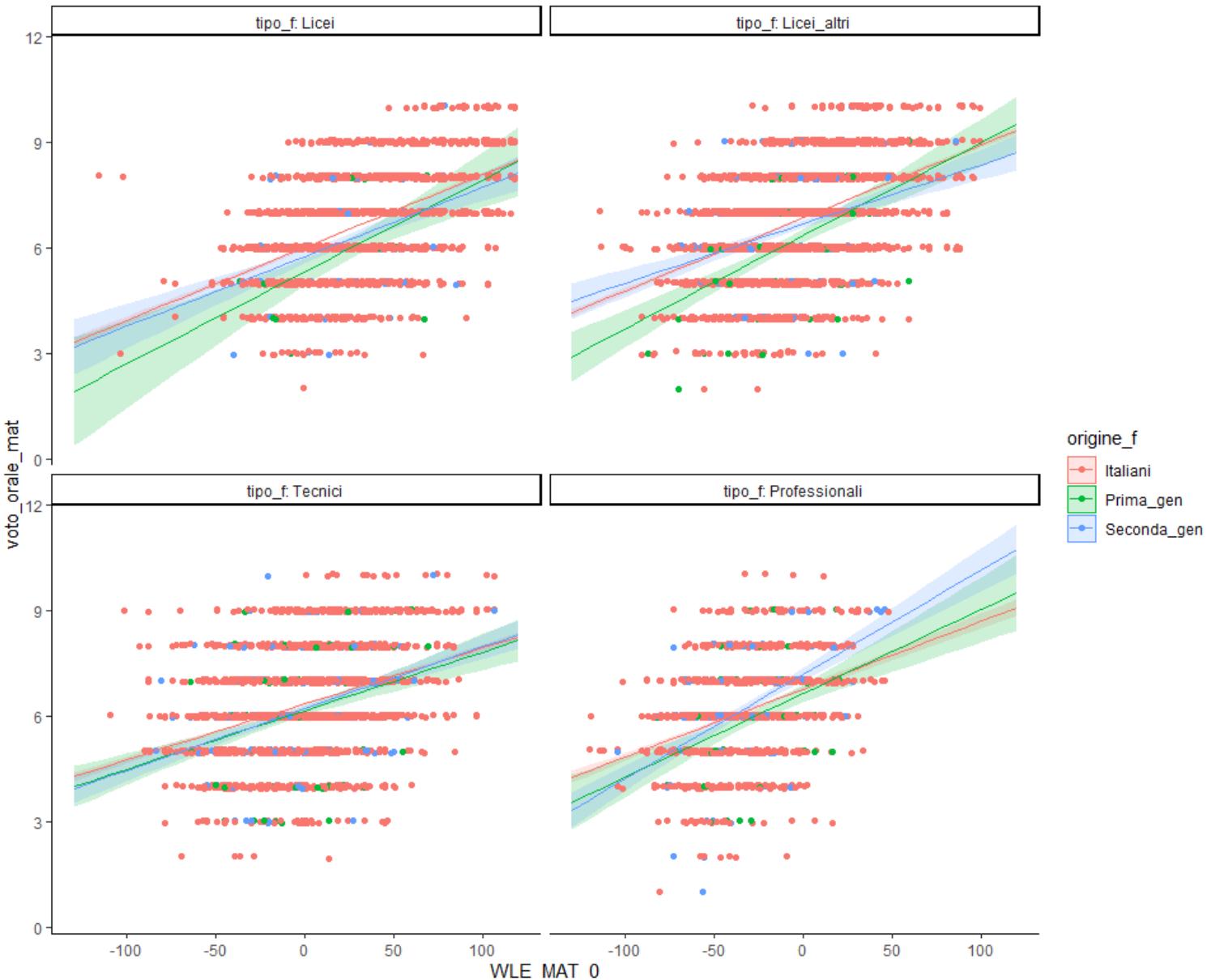
origine_f	median	sd
Italiani	6.50	0.02
Prima_gen	6.16	0.09
Seconda_gen	6.36	0.06



Voto = b0 + b1*cittadinanza + b2*inv_score +
b3*cittadinanza:inv_score



Voto = b₀ +
 b₁*cittadinanza +
 b₂*inv_score +
 b₃*tipo_scuola +
 b₄*citt:inv_sc +
 b₅*citt:tipo +
 b₆*inv_sc:tipo +
 b₇*citt:inv:tipo





Thank you for your attention!

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