Science, Technology and new generations. Youngsters and STEM studies

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International ROSE Project
The Relevance of Science Education

- **ROSE**:

  acronym of: *The Relevance Of Science Education*

- **Promoters**:

  prof. Svein Sjøberg, dr. Camilla Schreiner
  Department of Teacher Education and School Development, University of Oslo

- **Network**:

  42 Countries: Africa, Asia, Australia and Europe

The Rose project

An instrument that aims to map out attitudinal or affective perspectives on S&T in education and in society as seen by 15 year old learners

To promote an informed discussion on how to make science education more relevant and meaningful for learners in ways that respect gender differences and cultural diversity

ROSE Survey in ITALY
(field work 2008)

Schools

- 40 high schools

  (2 hs for each Italian region: 1 humanistic e 1 technical)

- 80 classes' second grade

  (2 classes each school)

Sample

- 1445 students

  (775 females, 670 males)

Type of School	Area
Humanistic HS: 392	North-West: 297
Scientific HS: 512	North-East: 303
Technical HS: 419	Centre: 361
Vocational HS: 122	South and Isles: 484

Students' interest in topics somehow related to science, average values by gender (m = 1; M = 4)

Topics	Boys	Girls	Average
Diseases, treatment and prevention	3.06	3.33	3.20
Harmful substances and technological risks	2.93	3.13	3.04
Astronomy and space exploration	3.14	2.89	3.00
Alternative energy and energy saving	3.12	2.90	3.00
Sexuality and reproduction	2.71	3.11	2.92
Natural threat to one's health	2.91	2.89	2.90
Environmental protection	2.86	2.80	2.83
ICT operation	2.94	2.71	2.82
Paranormal phenomena	2.50	3.00	2.77
Optical phenomena	2.51	2.84	2.68
Chemical weapons and nuclear	3.08	2.30	2.66
Animals and plants	2.69	2.62	2.65
Social aspects of science	2.73	2.58	2.65
Physical care for one's body	2.22	2.94	2.61

Attitudes towards scientific subjects, average values by gender, type of school (1-4 scale)

	Boys	Girls	Average
Interest in scientific subjects	2.36	1.87	2.11
Perceived importance of science learned at school	2.73	2.71	2.72
Difficulties in studying science	2.65	2.84	2.75

	Humanities h. schools	Science h. schools	Technical schools	Vocational schools
Interest in scientific subjects	1.88	2.36	2.12	1.67
Perceived importance of science learned at school	2.77	2.81	2.62	2.44
Difficulties in studying science	2.77	2.67	2.80	2.85

Attitudes towards work, average values by gender (1-4 scale)

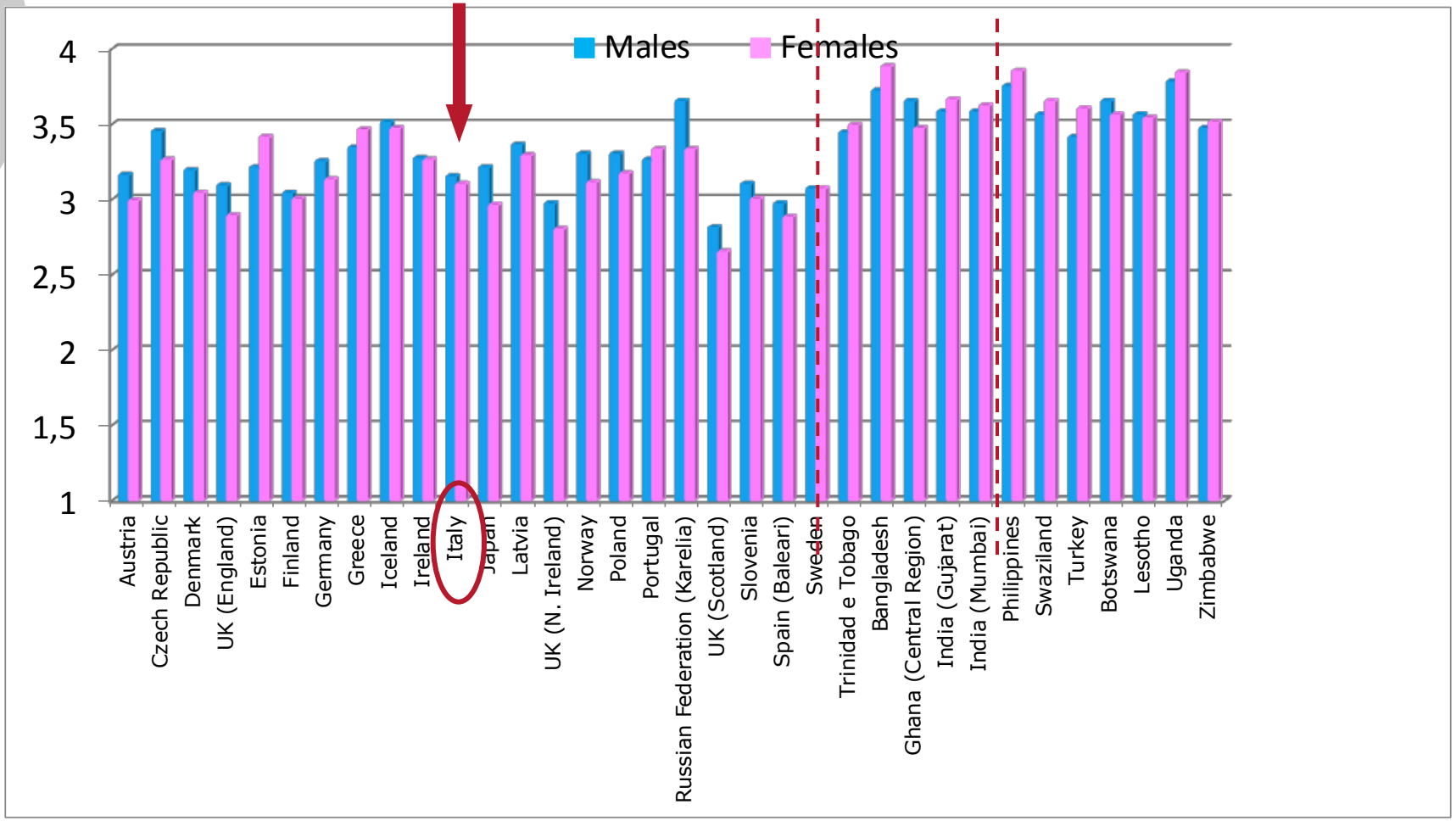
	Boys	Girls	Average
Creativeness	3.37	3.45	3.41
Independence	3.31	3.44	3.38
Time for oneself	3.22	3.23	3.23
Fame and success	2.89	2.53	2.70
Environment inclination	2.30	2.53	2.43
Manual ability	2.60	1.91	2.23

Attitudes towards Science (1-4 scale)

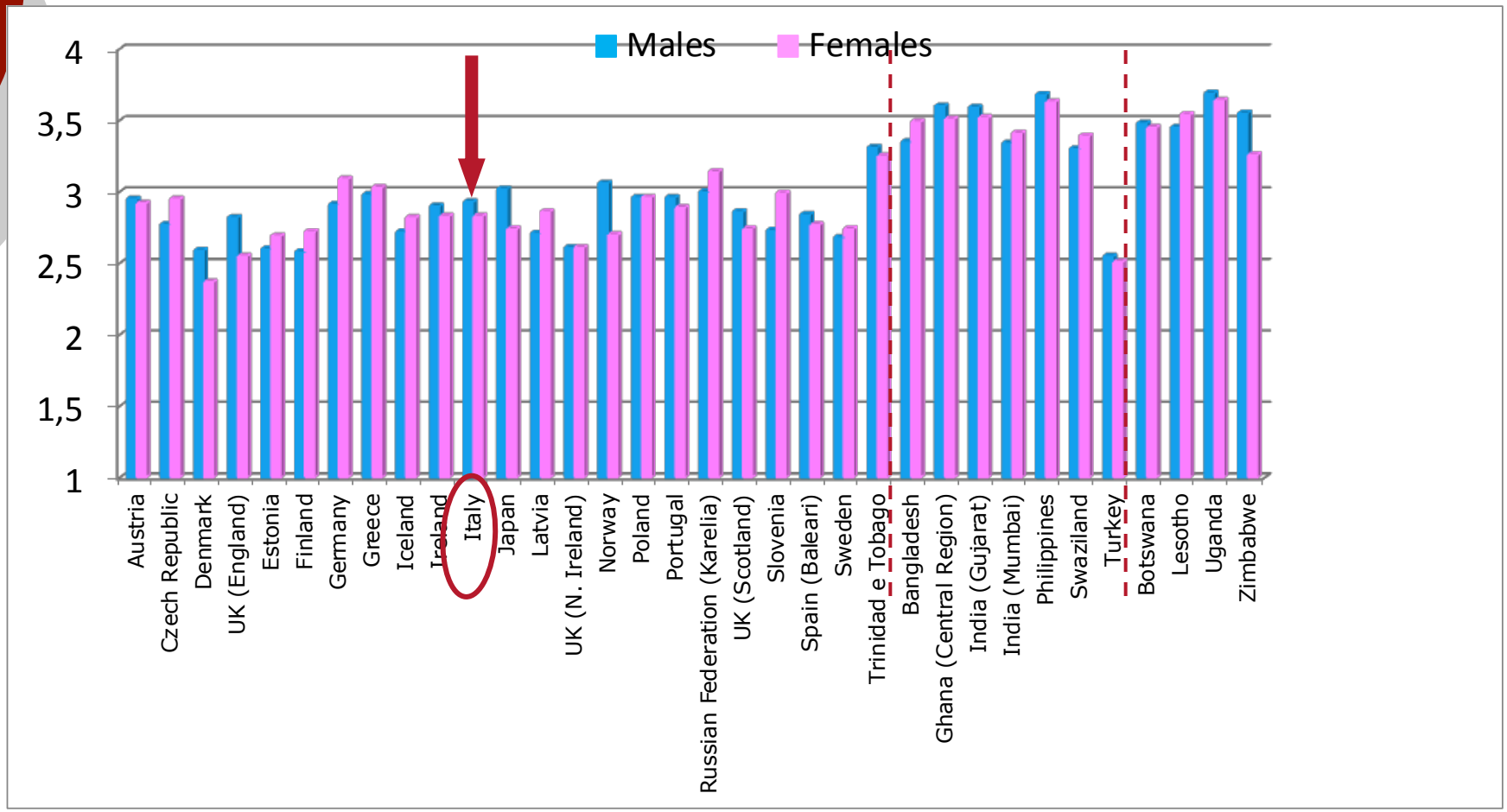
	Boys	Girls	Average
Trust in benefits of science	3.04	2.96	3.00
Trust in science for developing countries	2.25	2.01	2.13
Trust in scientists	2.26	2.14	2.20

«Science and Technology are important for Society»

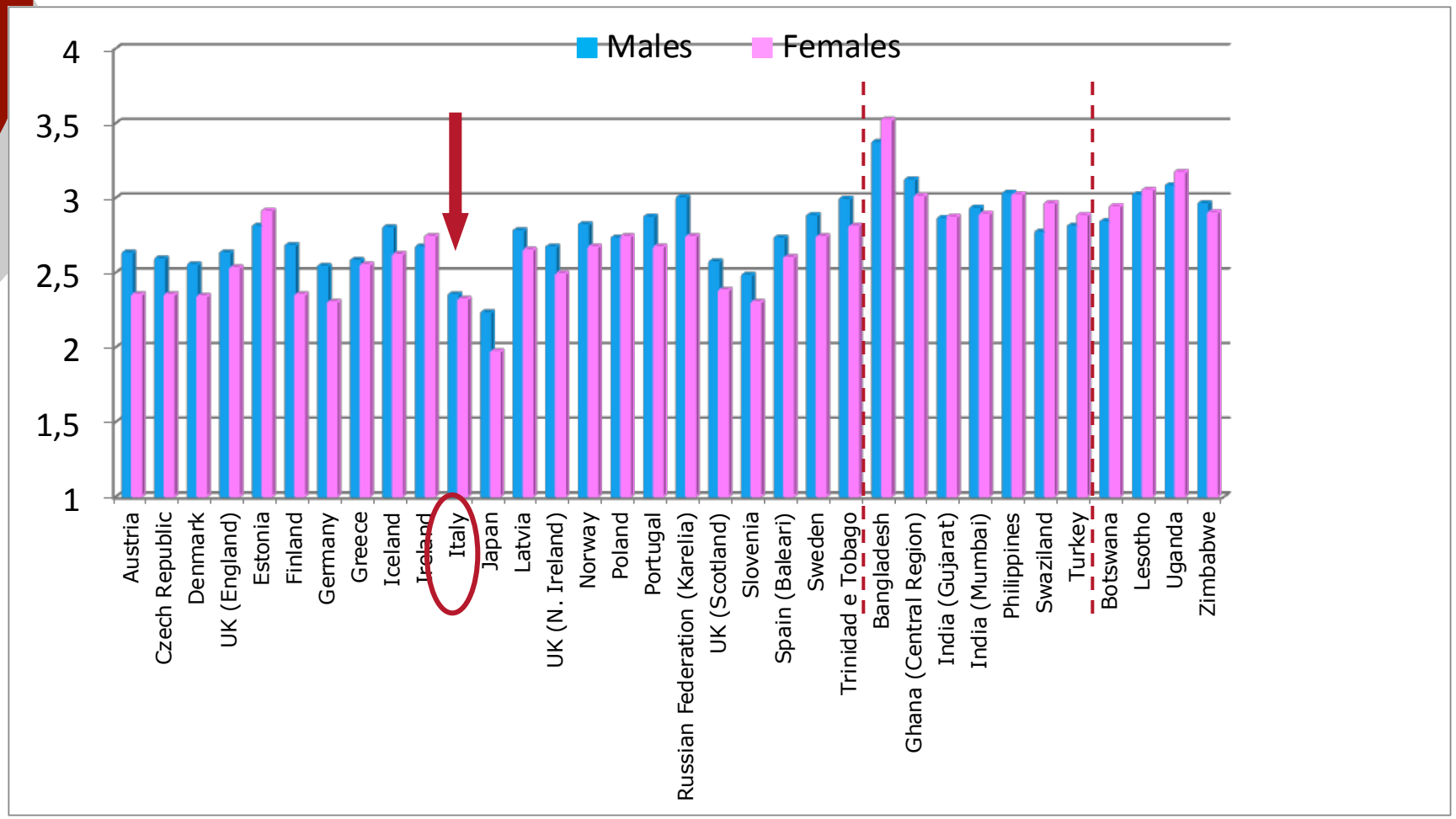
(left to right Human Development index position H. to l.)



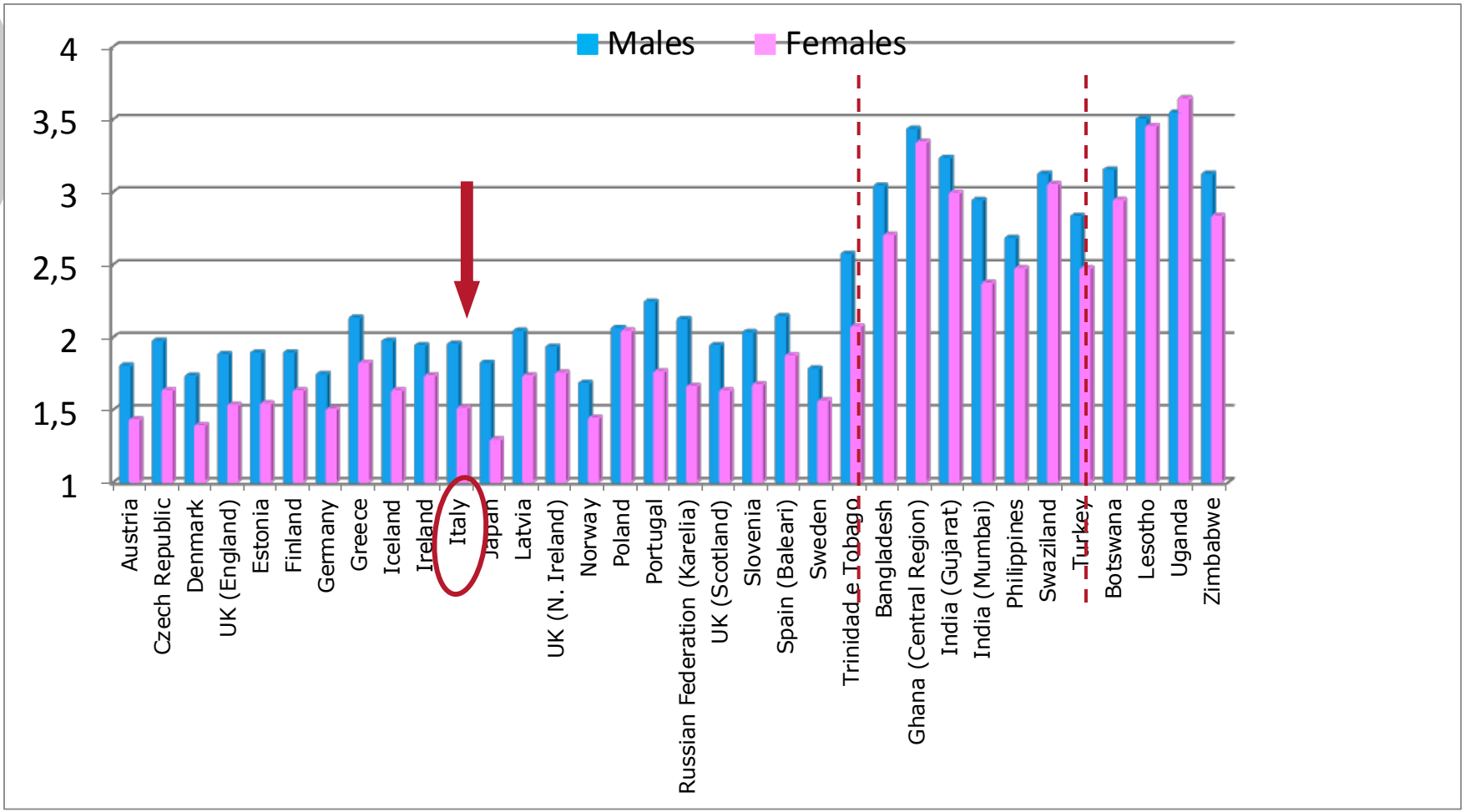
«School science is interesting»



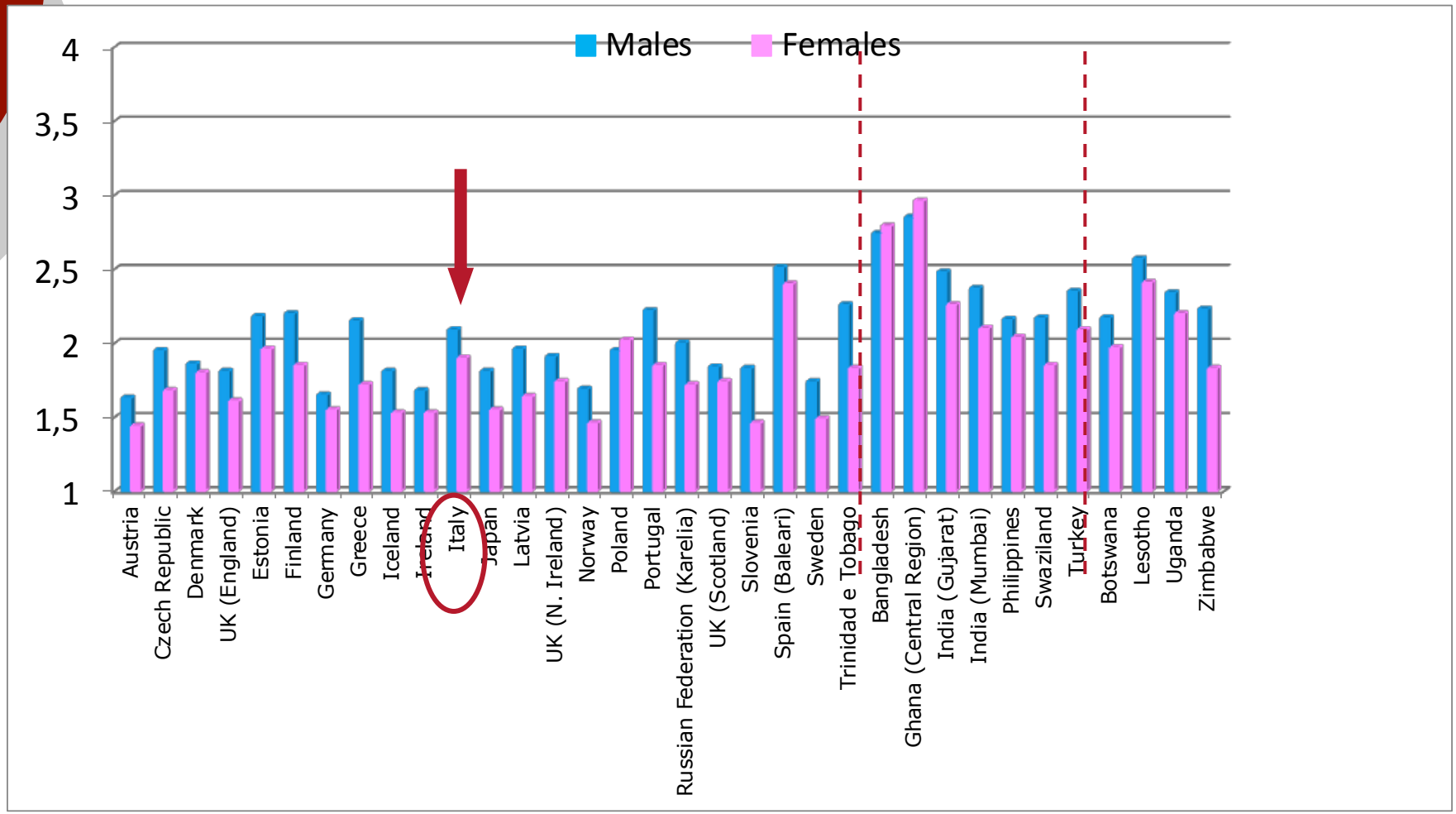
«The benefits of science are greater than the harmful effects it could have»



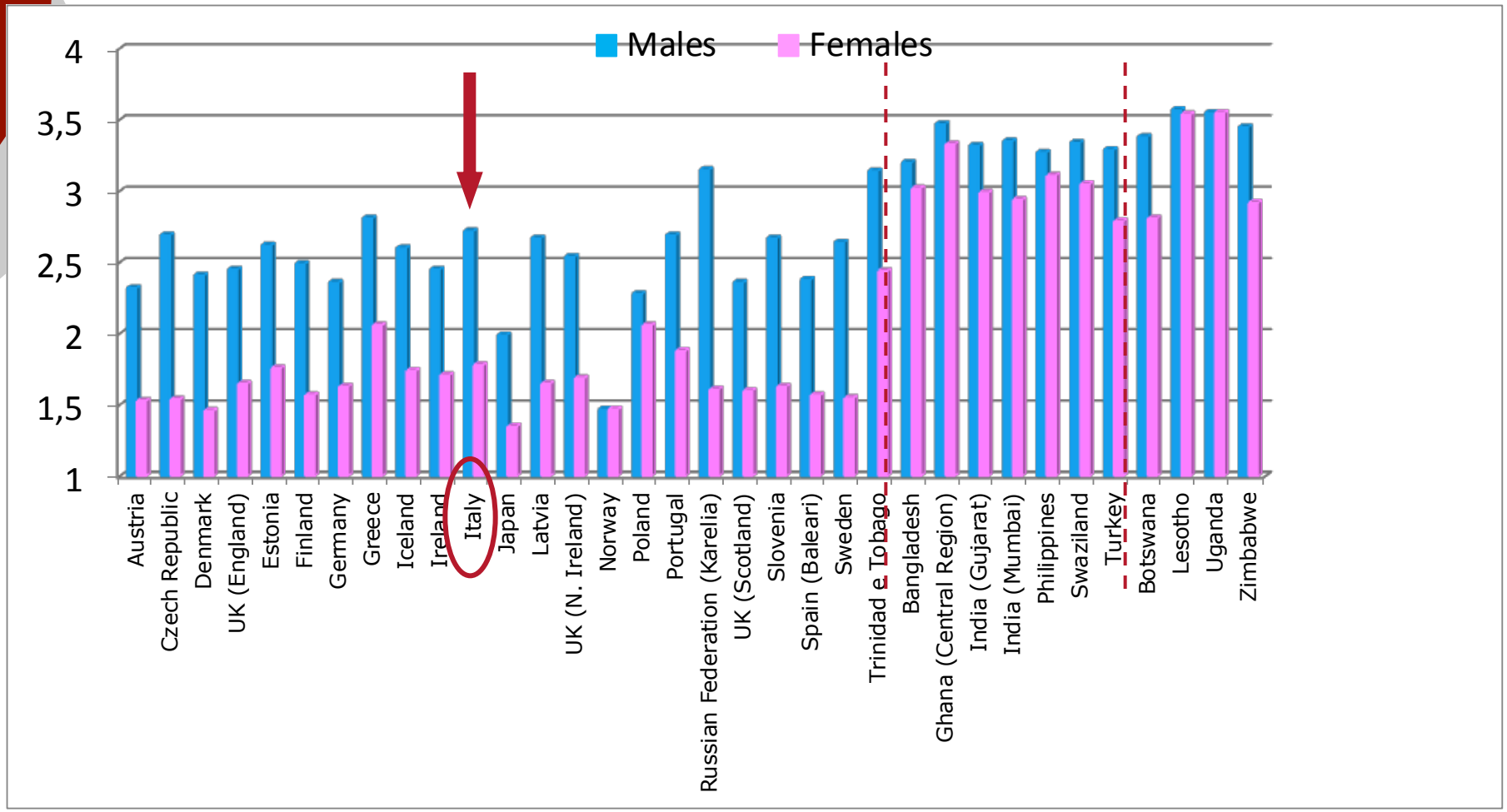
«I would like to become a scientist»



«We should always trust what scientist have to say»



«I would like to get a job in technology»



Fresh students (19th) and STEM studies at the University

Iris Project

5 countries consortium:

Norway – Oslo Univ.

Denmark

Italy

UK

Slovenia

Goals and sample
(field work: spring 2010)

STEM studies' access
Recruitment and retention activities
Gender
Drop-out and opt-out

Qualitative and quantitative methods

Stratified sample by ISCED code, degree and area; Population: N. 40.000

Sample: n. 2667 valid cases (M:60,6% – F: 39,4%)

Isced Coorts: Biology; Physics; Chemistry; Mathematics; Statistics; Engineer: Mechanical, Electronics, Chemical; Computer Science

Cultural background

Females come mainly from humanistic schools

Males come from technical schools (+24%)

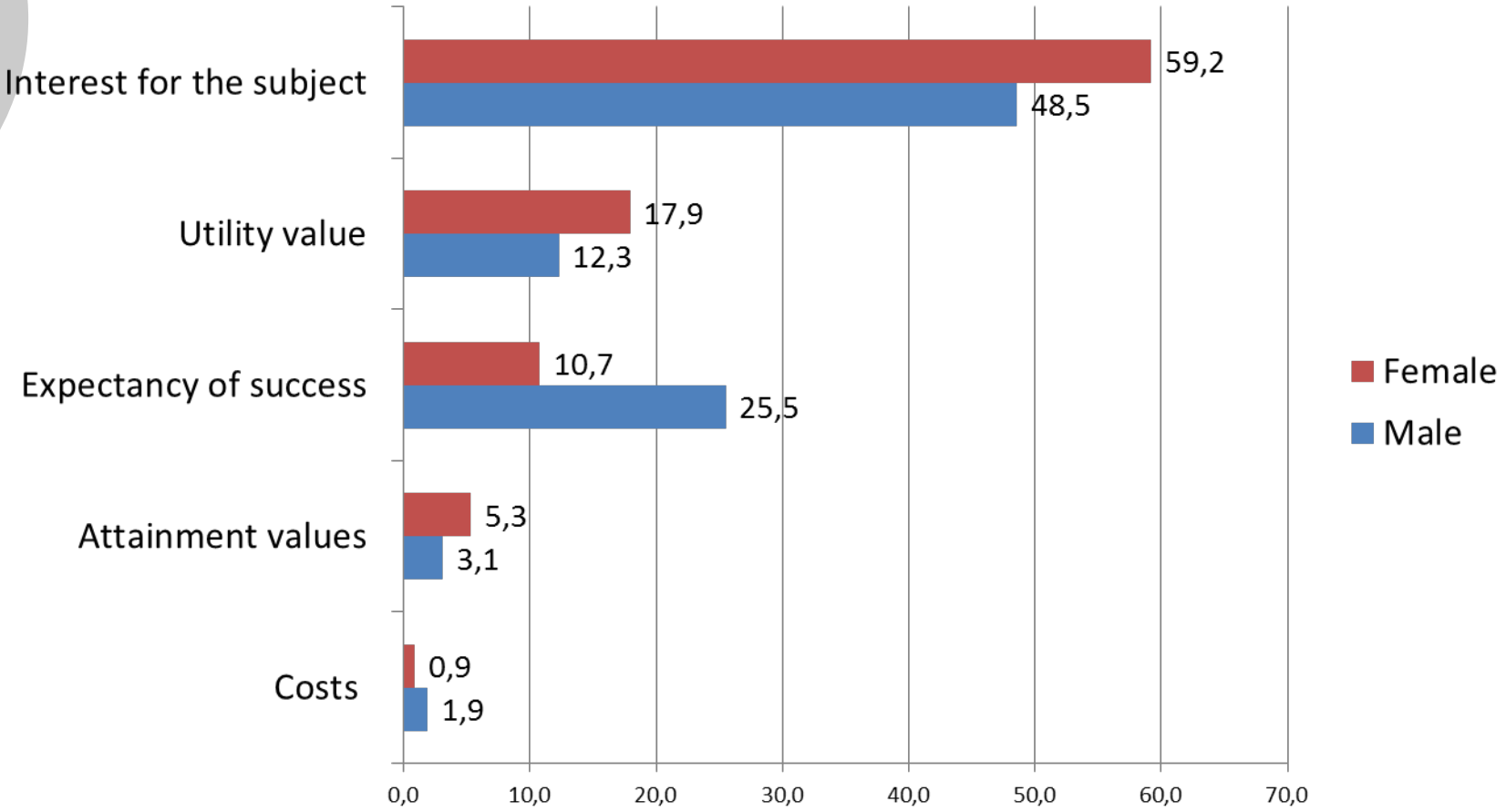
Female: parents with tertiary titles (+7%)

Medium average high school diploma:

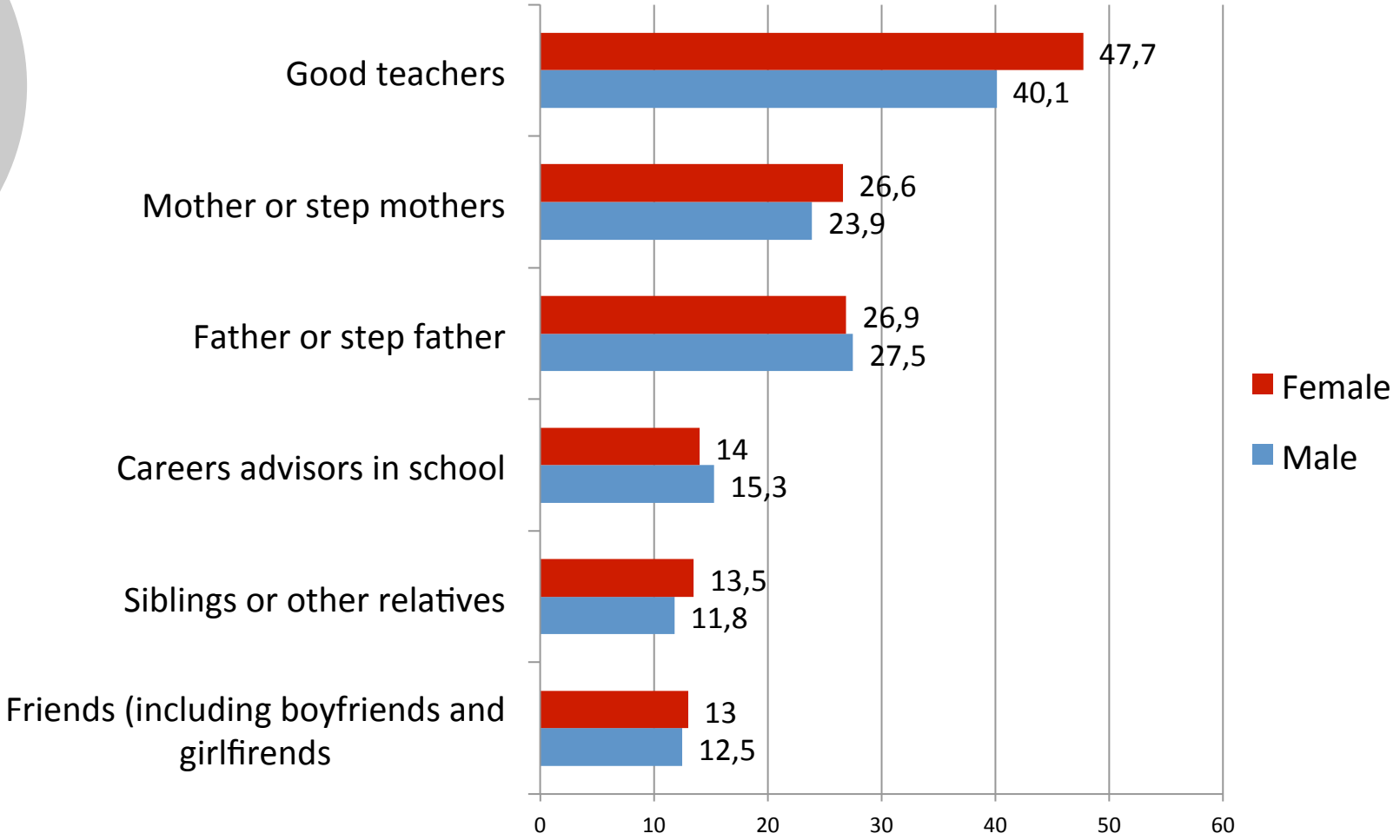
F= 87,5/100 (ds: 11,3)

M= 85,6/100 (ds: 11,8)

Choice's process: motivation



Choice's process: key persons



School experiences (F-M)

	Interest towards the subject	Previous marks	Experiments and laboratories	Field experiences	Lessons on Science and society	Lessons on practical Science training	Maths application	Understanding the right answer
Biology and Biotec.	2.7	- 4.4	- 1.1	- 3.9	- 5.3	- 3.7	- 4.6	- 1.1
Physics	1.0	9.0	- 7.7	- 3.6	1.5	9.2	9.3	- 2.3
Chemistry	0.0	9.9	- 11.6	- 9.5	- 5.0	- 10.7	- 0.5	- 22.7
Mathematics	- 4.8	3.8	1.6	- 2.3	1.2	- 4.9	1.4	- 7.7
Computer Science	- 21.9	1.5	- 6.8	- 7.7	5.6	- 2.8	33.3	9.9
Eng. Mechanical	8.2	6.3	- 15.1	- 15.2	12.3	8.3	27.3	2.1
Eng. Electronics	- 4.8	10.6	- 16.3	1.5	4.7	- 11.1	19.6	- 3.0
Eng. Chemical	2.5	- 12.8	- 6.9	- 7.9	19.3	0.0	0.5	- 0.9
Total	- 0.3	1.8	- 0.7	- 1.6	3.0	- 3.0	- 4.1	- 5.8

Media and experiences

(% of agree and strong agree; F: 1051 – M: 1609)

	Female	Male
Popular science books and magazines	35.9	32,5
TV programme	19,8	30
Science events	13,6	18,8
Books/science fiction movies	14,6	18,3
Films and tv drama (CSI, Numbers, Grey's anatomy)	29	15
Museum and science centres	23,6	12,3
Fund raising programme for scientific reseaarch (Telethon etc.)	16,9	5,9
Videogames	5	23

Gender, studies and careers

Difference F/M (% agree and strong agree)

	If I had a daughter I would encourage her to study science subjects at the university	A job in the tecnical-scientifical field is difficult to harmonize with growing up children	School encourages more male than female to study scientific subjects	Women are more apt to science than men	The working environment of science is dominated by males
Biology & Biotech.	1.6	1.1	0.3	2.4	5.1
Physics	2.1	5.6	-1.8	-0.4	9.5
Chemistry	10.3	0.8	11.3	16.9	-4.4
Mathematics	7.8	1.5	-3.5	2.3	12.7
Computer Science	13.2	5.3	1.6	14.4	**19.4**
Eng. Mechanics	23.2	-3.6	0.4	10.6	-2.0
Eng. Electronics	**29.4**	-4.6	8.8	0.6	3.1
Eng. Chemical	23.6	2.2	-6.6	8.4	16.5

Main Findings

- Predictors: laboratories in the schools (expecially for males)
- Secondary school is crucial in choosing the scientific degree
- Key persons: good teachers

Main Findings

- Gender features: similarities depends by strong self-selection; more sensitive to purely educational elements, sensitive on working group, mentoring programme,

- Media: imaginary, different programmes (not only educational and specialized programs)

References

- Rose network:
http://www.uv.uio.no/ils/english/research/projects/rose/

- Rose publication:

http://unesdoc.unesco.org/images/0018/001888/188885mo.pdf

- Iris network:

http://iris.fp-7.org/about-iris/

- www.observa.it