

Creating a sustainable scientific culture among young people: The importance of interest, joy and motivation, and the curses of testing and ranking **F2KS, Brussels Nov 28th 2014**

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Plan A

1. A sustainable scientific culture...
2. The importance of interest, joy and motivation
3. The curses of testing and ranking
4. So what? Conclusions...

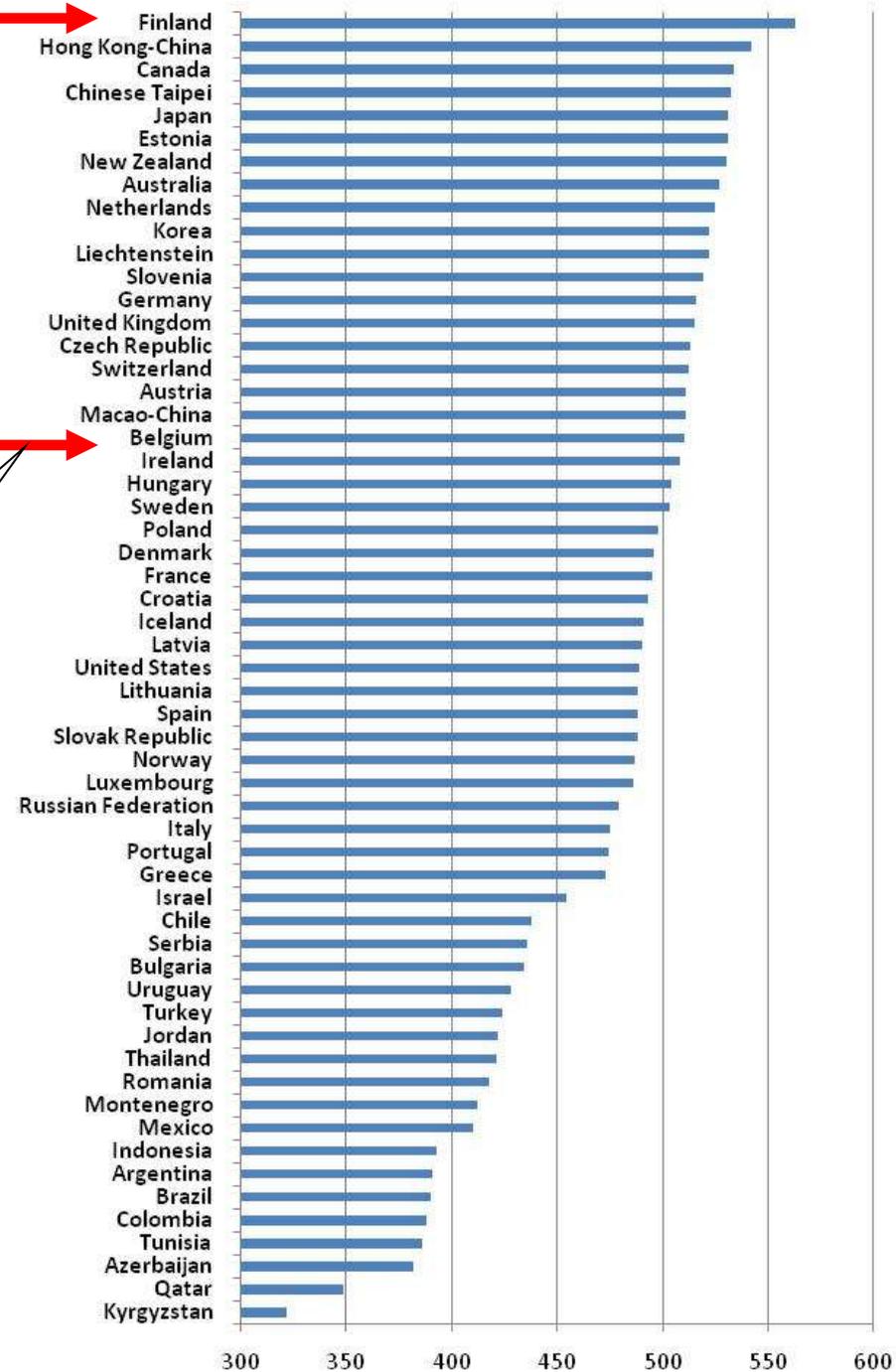
A sustainable scientific culture:

- Lifelong perspectives are more important than high scores at 11, 13 (TIMSS) and 15 (PISA)
 - Interests, attitudes and values are important in S&T ed.
 - as learning goals
 - and as **determinants of future behaviour**
 - Also important for those who do *not* pursue S&T careers (i.e. the majority)
 - When science concepts are forgotten, the “ethos”, “atmosphere” or “body language” of the subject remains
 - In many countries:
Students are on top of TIMSS/PISA league table, but they hate the subject
 - This is *not* sustainable, and not good for possible recruitment
-

Finland:
Highest science score

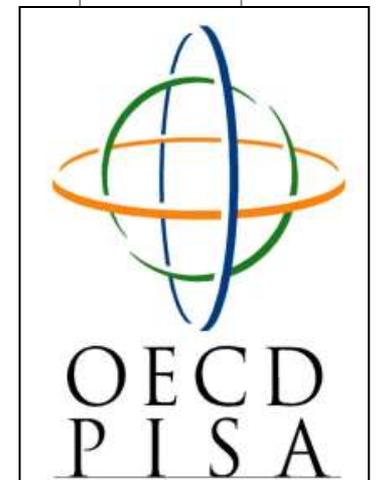
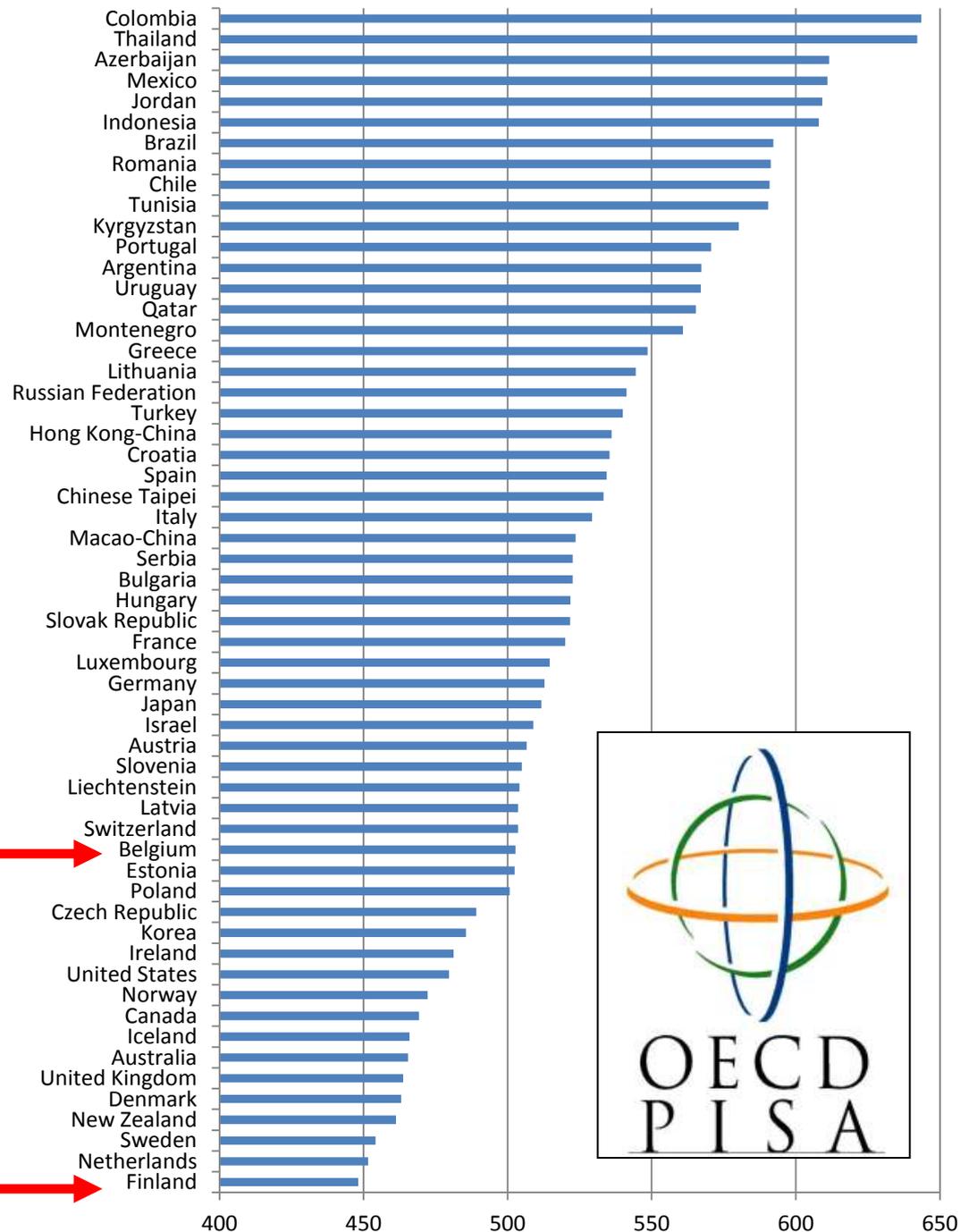
PISA 2006 Science mean score

Belgium



OECD
PISA

PISA 2006 Science *Interest score*



Finland:
Highest in science
score,
lowest in interest...

So how well are we doing?

What about **interest, joy and motivation?**

- Looking back at **School science** –
at the age of 15, the end of obligatory school
 - S&T: Important for society, but ...
 - **Less** interesting than other subjects
 - Has **not** opened my eyes for interesting jobs
 - Has **not** increased appreciation for nature
 - Has **not** taught me how to take care of my health
 - Has **not** increased my curiosity
 - Has **not** shown the importance of S&T for our way of living
 - Has **meagre** intention of choosing science or technology
-
- **Just an indication of data behind these assertions...**

Sources and evidence

■ ROSE-study

Attitudes, interests etc.

15 year old students, 40+ countries

■ Eurobarometer

on Science and Technology

Attitudes, interests, values,
knowledge, priorities etc.

Adults, 32 European countries



ROSE and Eurobarometer

- Standard survey methods
- Target populations:
 - EB: Adults (15+) Europe
 - ROSE: 15 year-olds in schools: Global
- Representative samples ($N > 1000$) in each country
- EB and ROSE: appr. 200 items!

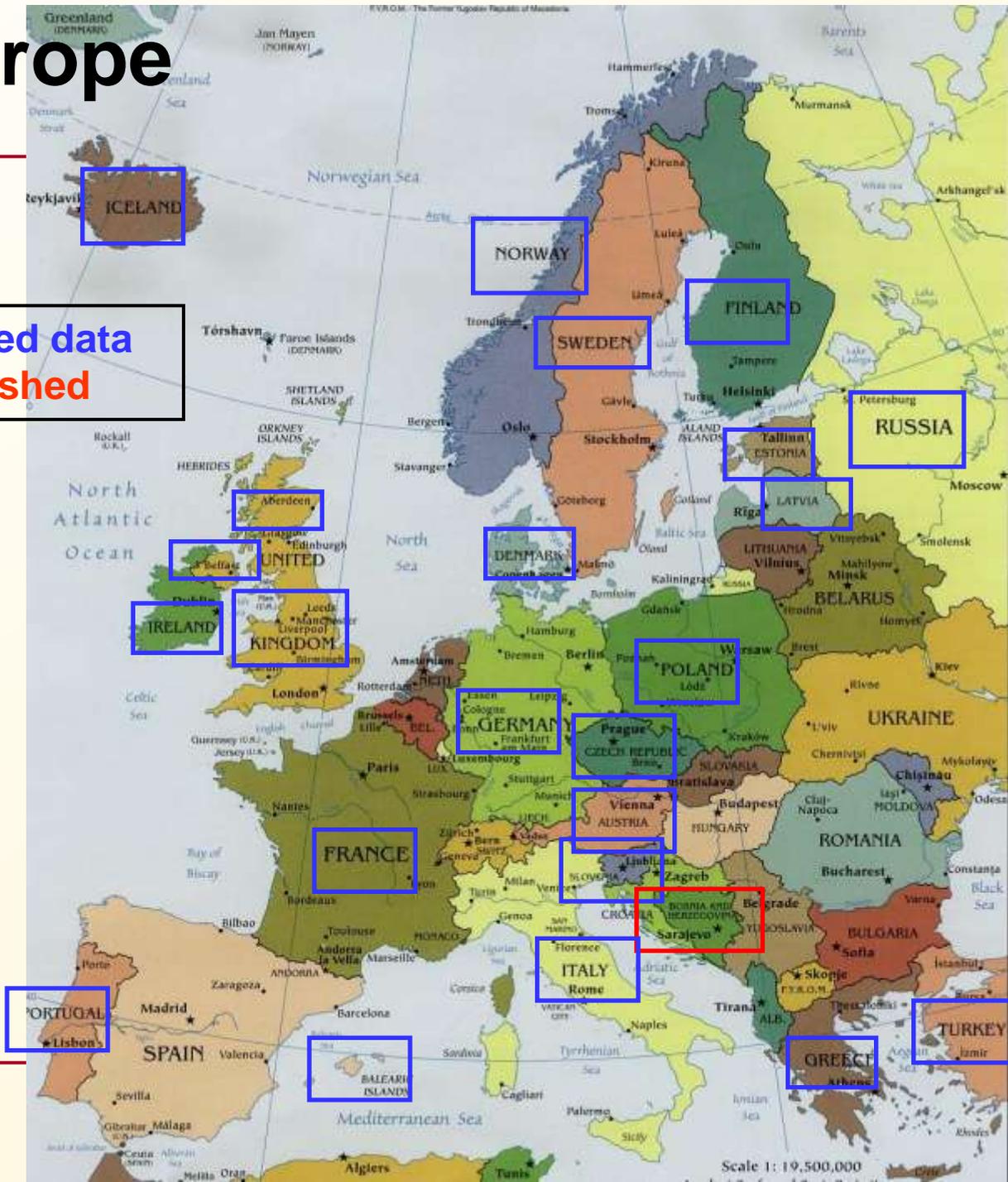




ROSE Europe

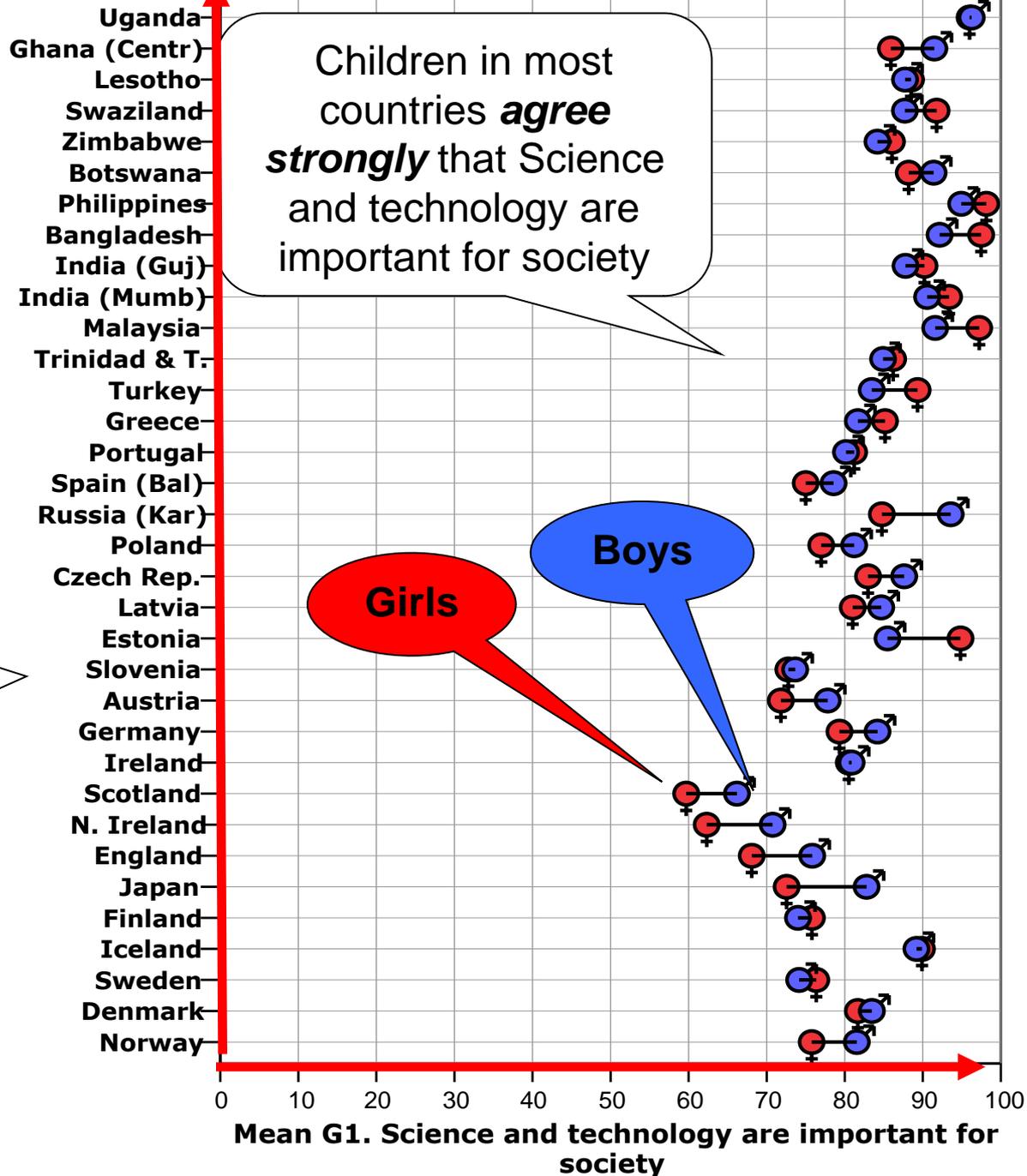
- Austria
- Bosnia and Herzegovina
- Denmark
- Czech Republic
- England
- Estonia
- Finland
- France
- Germany
- Greece
- Iceland
- Ireland
- Italy
- Israel
- Latvia
- Northern Ireland
- Norway
- Poland
- Portugal
- Russia (Karelia)
- Scotland
- Slovenia
- Spain (Balears)
- Sweden
- Turkey

Collected data
Not finished

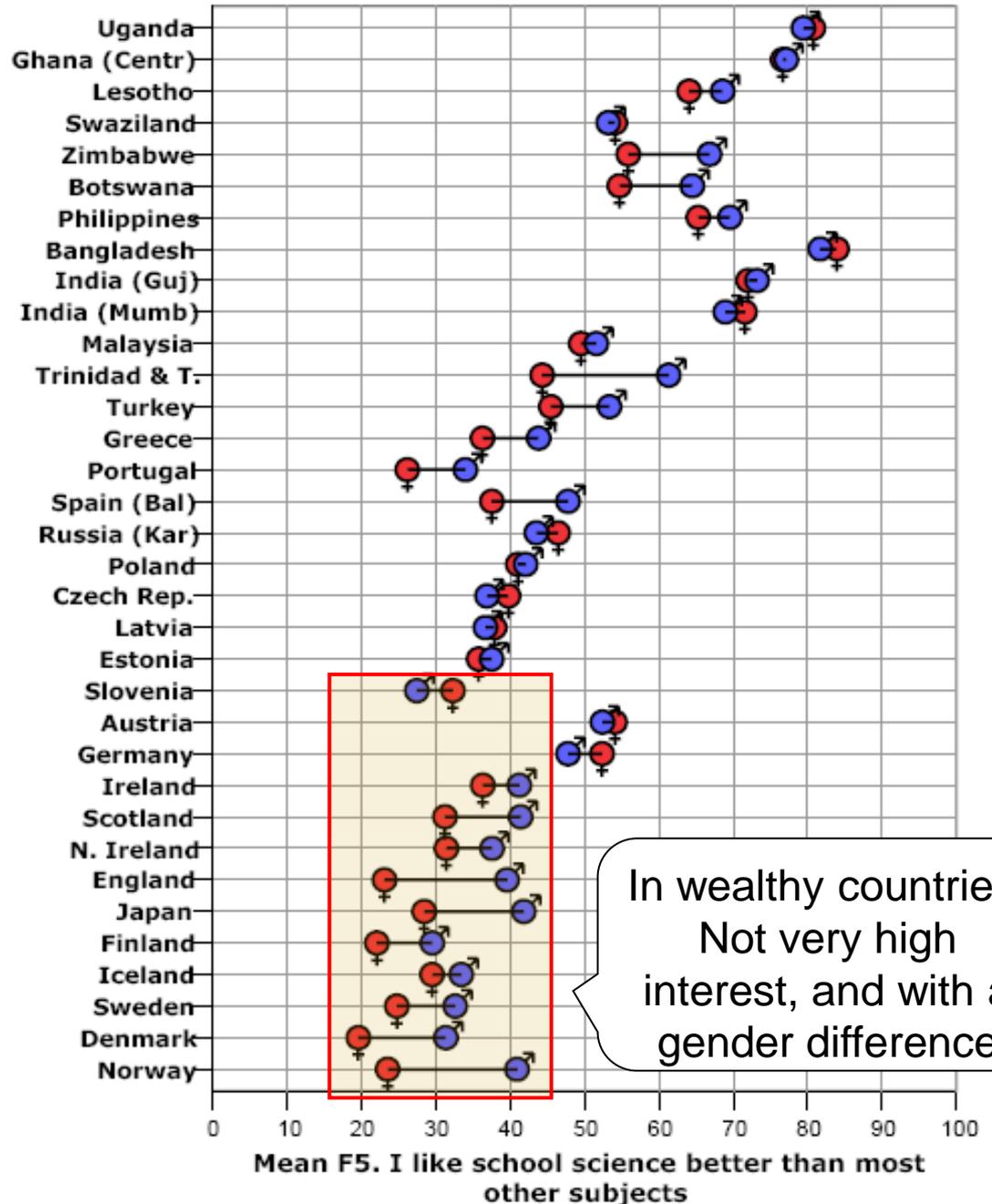


Science and technology are important for society

Countries are sorted by Human Development Index (and geography)

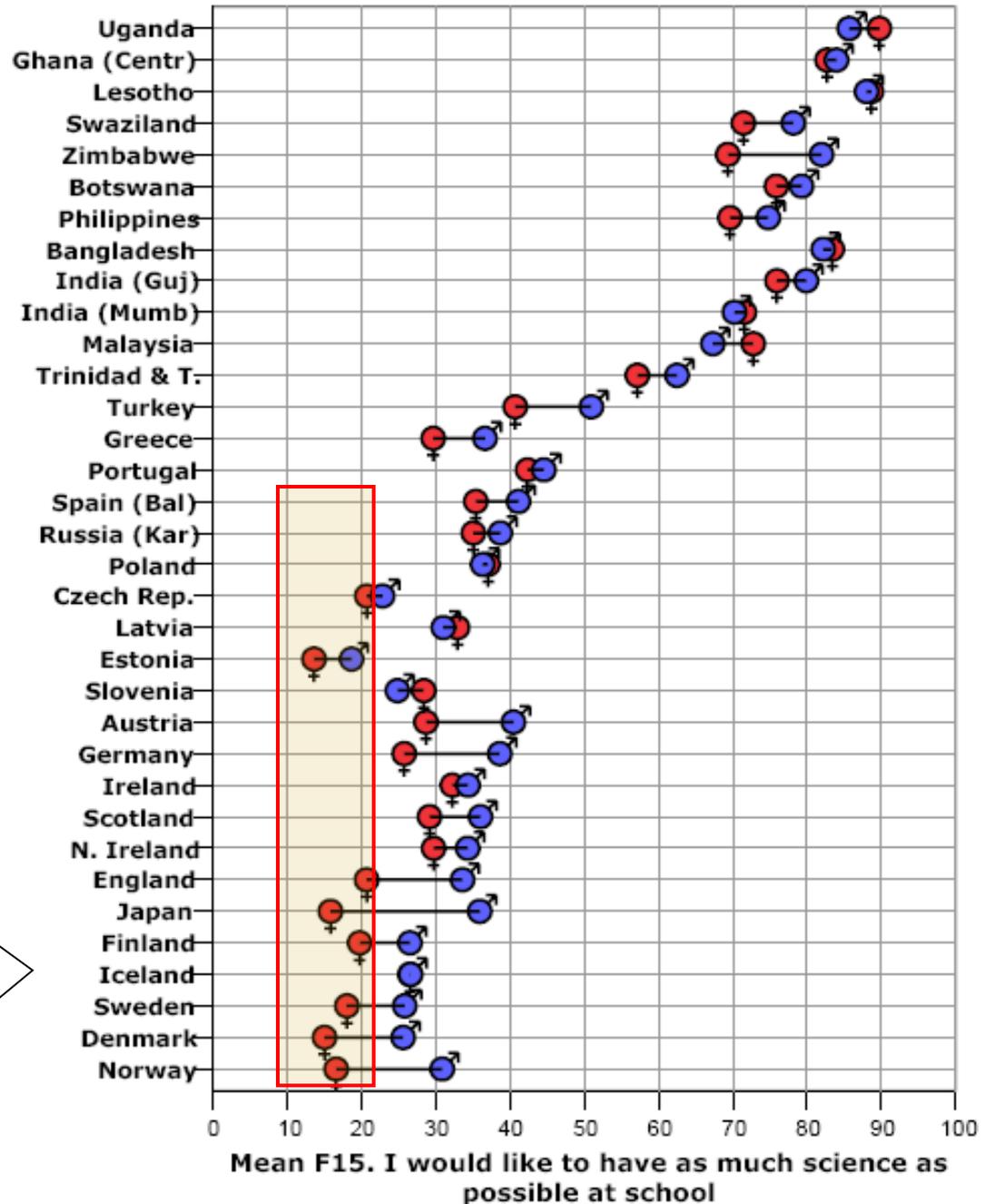


I like school science better than most other subjects

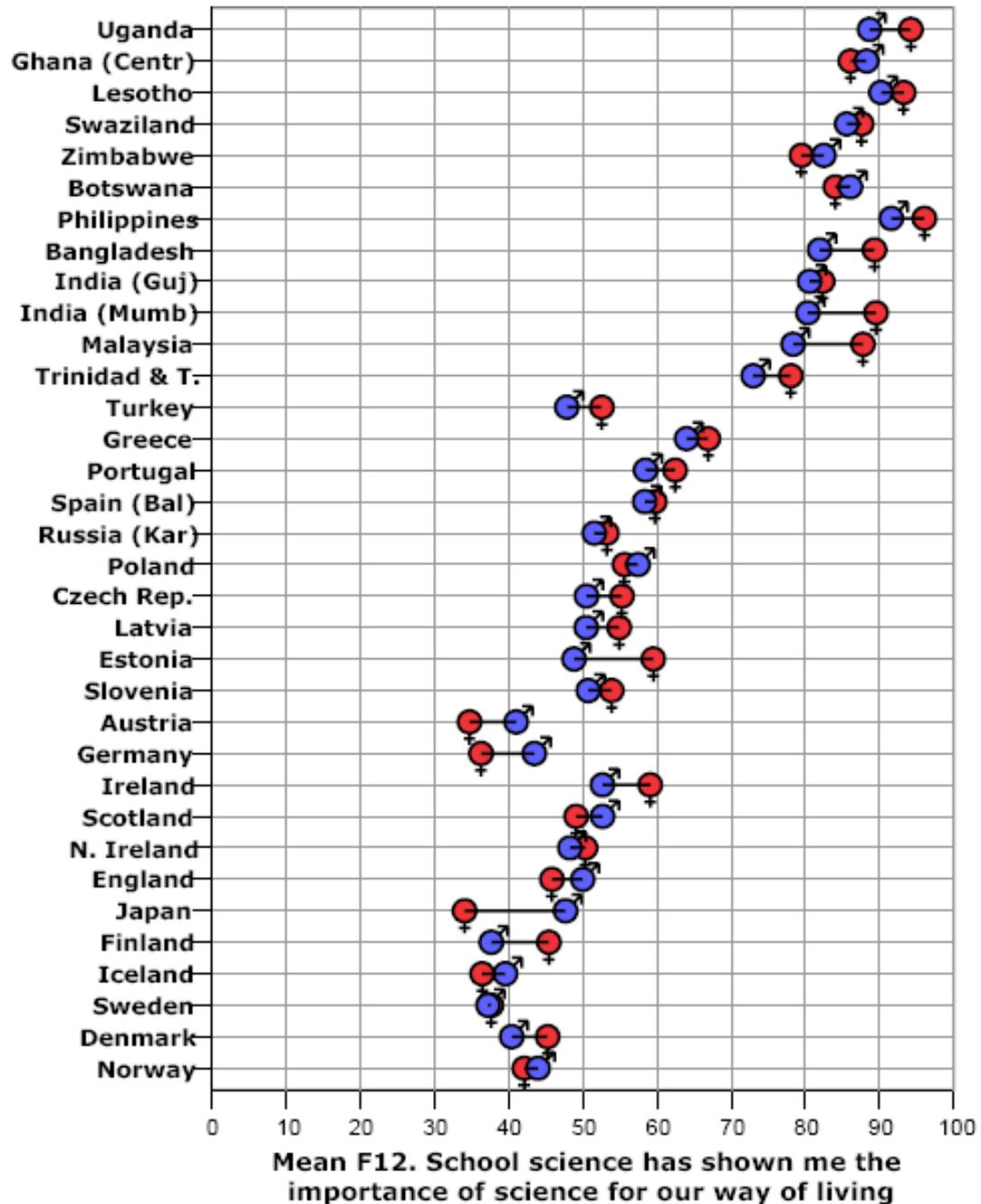


I would like to have as much science as possible at school

In wealthy countries, young people are not enthusiastic about school science -- in particular not the **girls**



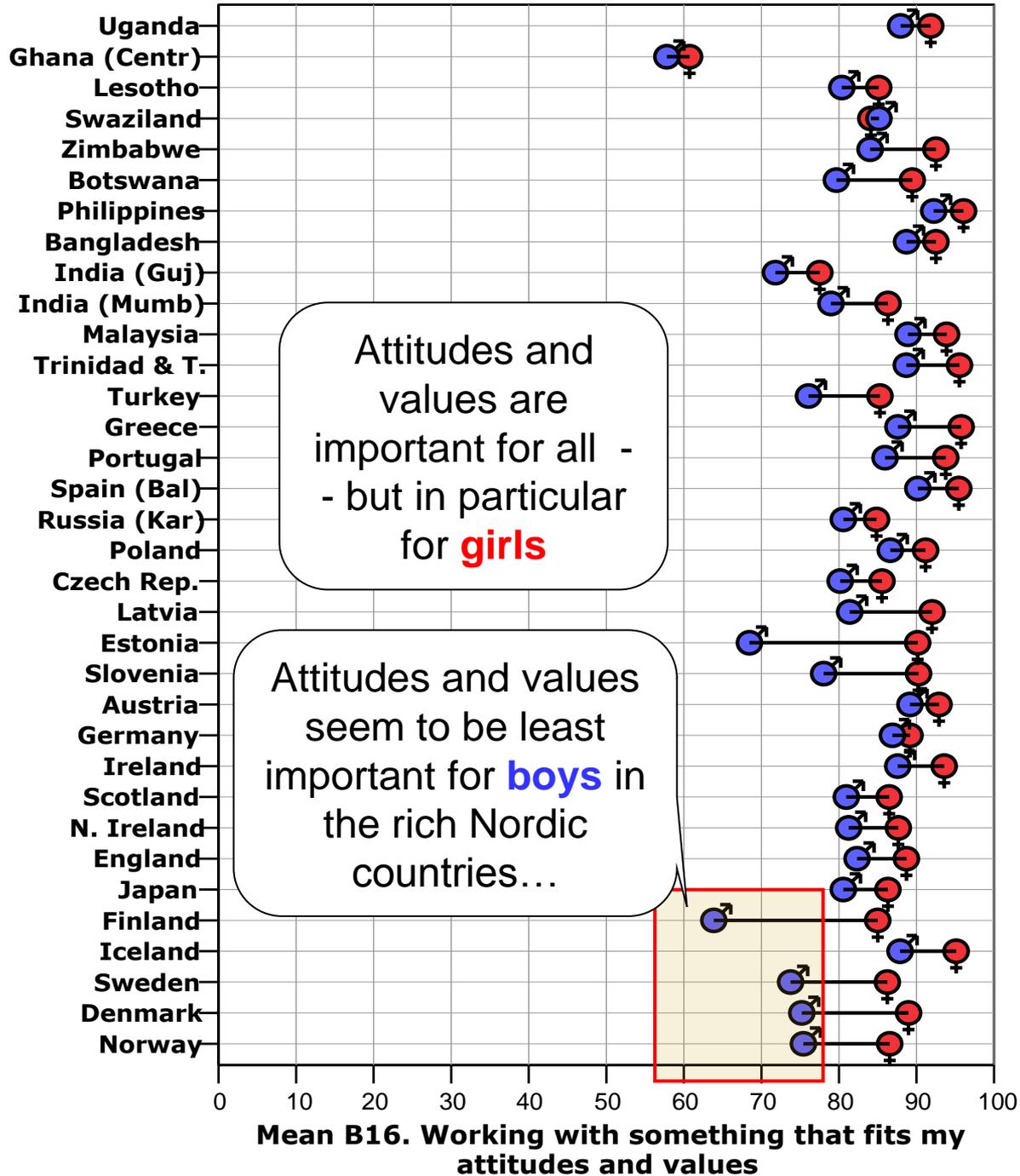
School science has shown me the importance of science for our way of living.



Important for my future work:

- The prime importance of **values, attitudes and meaning!**
(For **Girls** in particular)
 - **Girls'** priority:
Working with, and helping people
 - **Boys'** priority:
Working with their hands, with things, machines and tools
 - (AND: Earning lots of money, becoming the boss at the job, becoming famous ---
 - and *having an easy job...*)
-

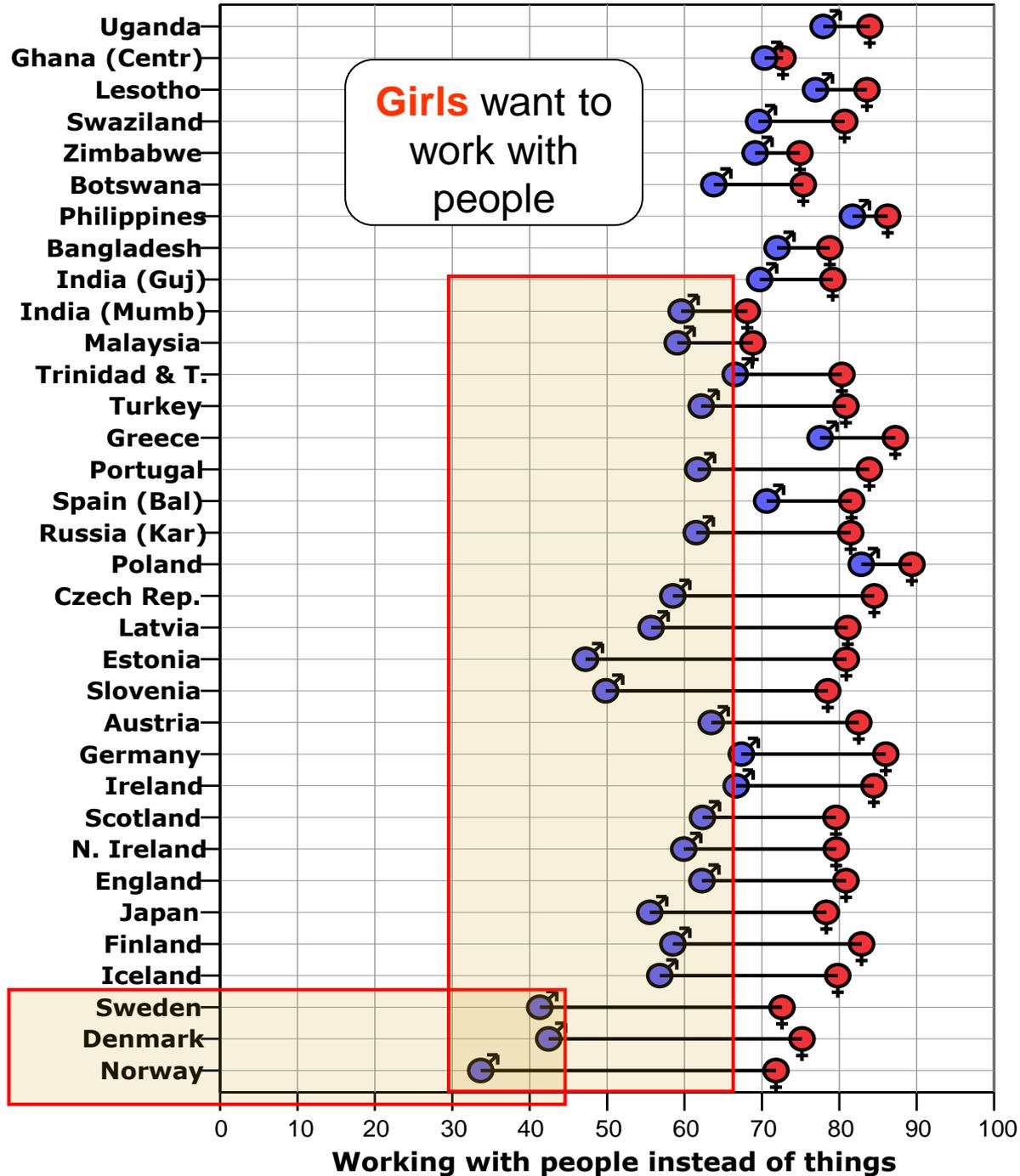
Working with something that fits my attitudes and values



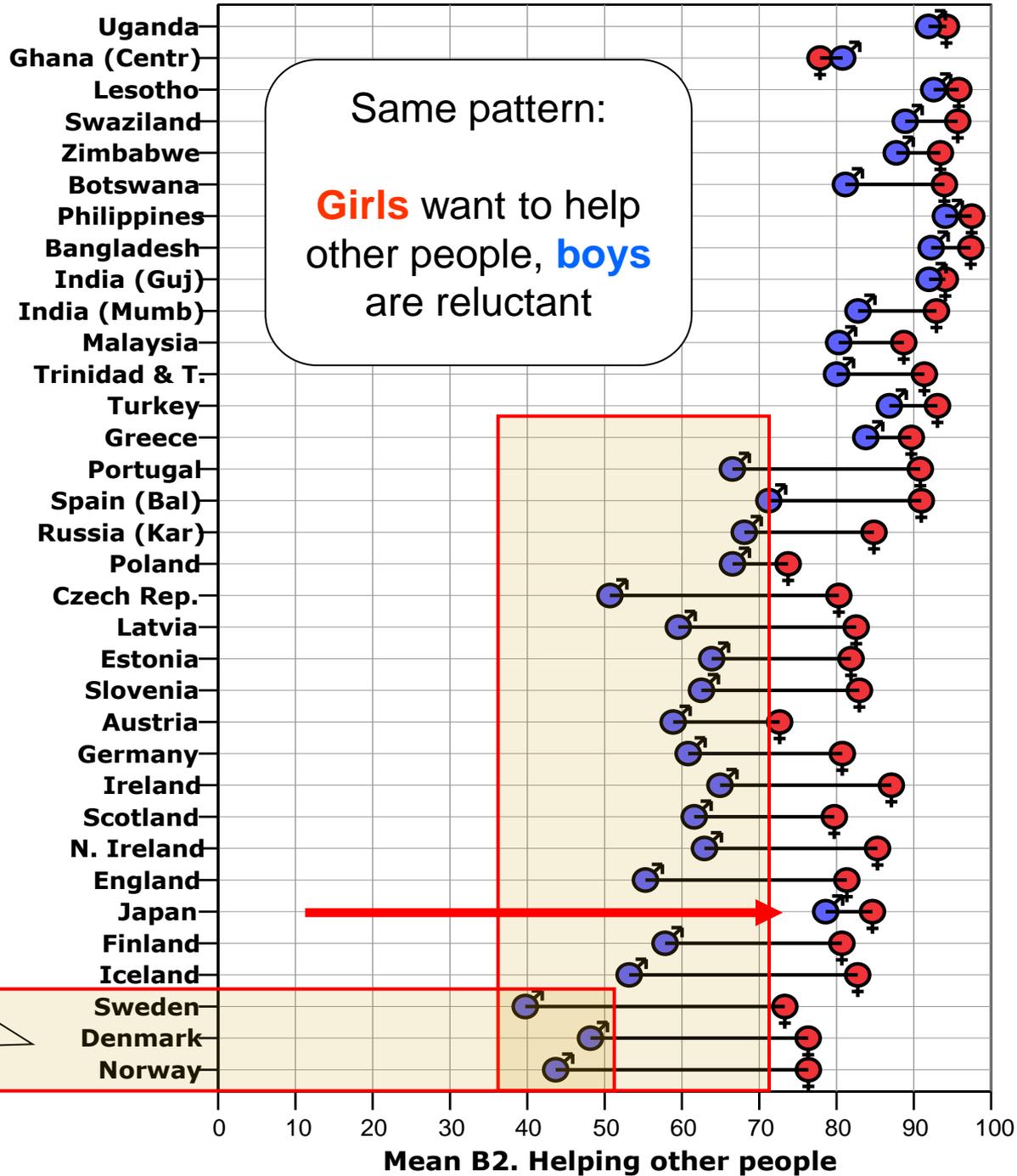
Future work:

“Working with people rather than things”

Many **boys**, in particular in Scandinavia, are not very interested in working with people.

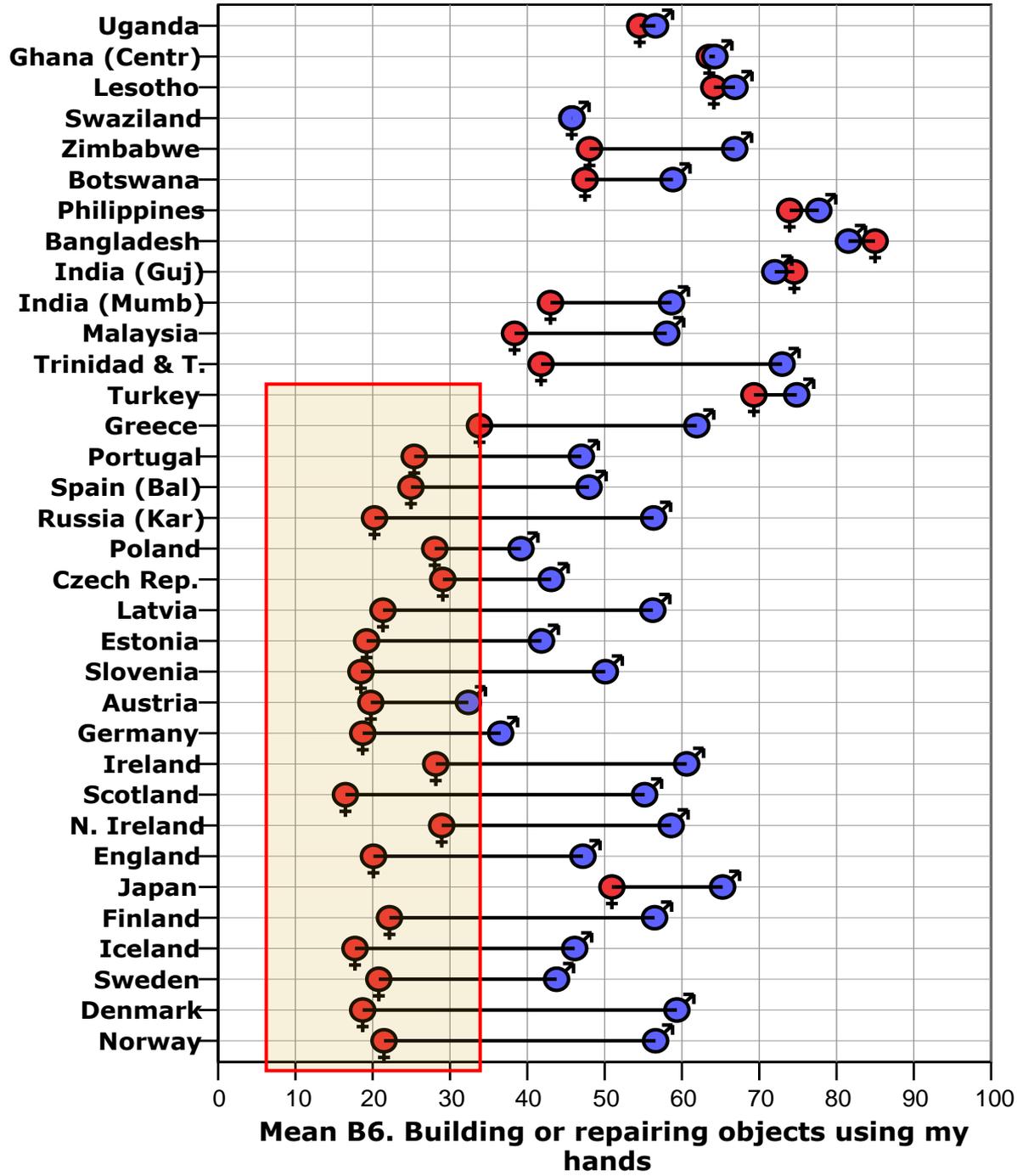


Helping other people



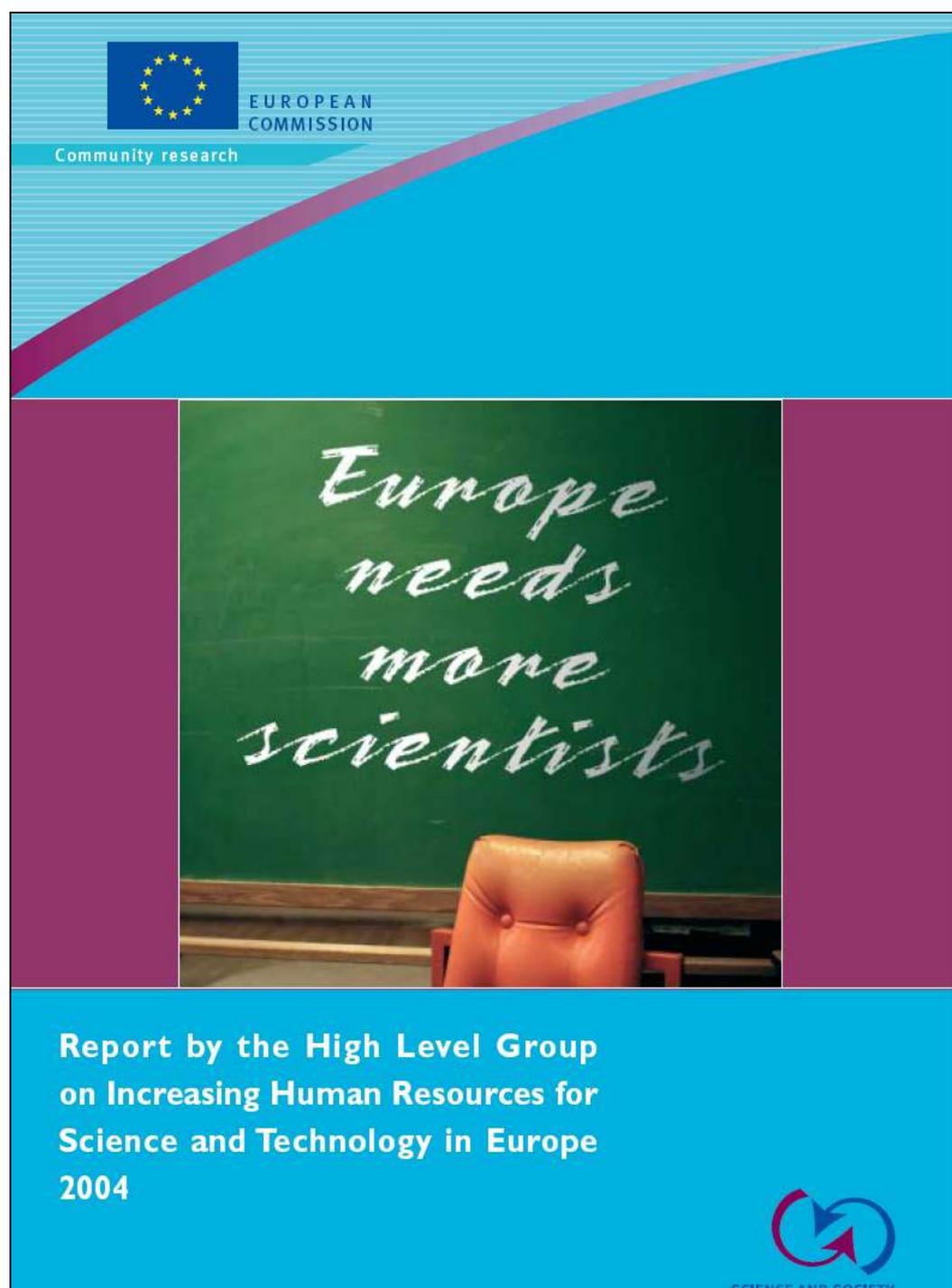
Building or repairing objects using my hands

Boys want a job where they can build and repair things with their hands – girls do **not** want such jobs!



Recruitment to S&T: A prime political concern for Europe and (most) OECD Countries...

The Gago report



The image shows the cover of a report. At the top left is the European Commission logo with the text 'EUROPEAN COMMISSION' and 'Community research' below it. The background is a light blue gradient with a purple curved line. In the center is a photograph of a green chalkboard with the handwritten text 'Europe needs more scientists' in white. Below the chalkboard is a brown leather chair. At the bottom, the title 'Report by the High Level Group on Increasing Human Resources for Science and Technology in Europe 2004' is written in white. In the bottom right corner is a logo for 'SCIENCE AND SOCIETY' featuring a stylized 'S' and 'C' intertwined.

EUROPEAN
COMMISSION

Community research

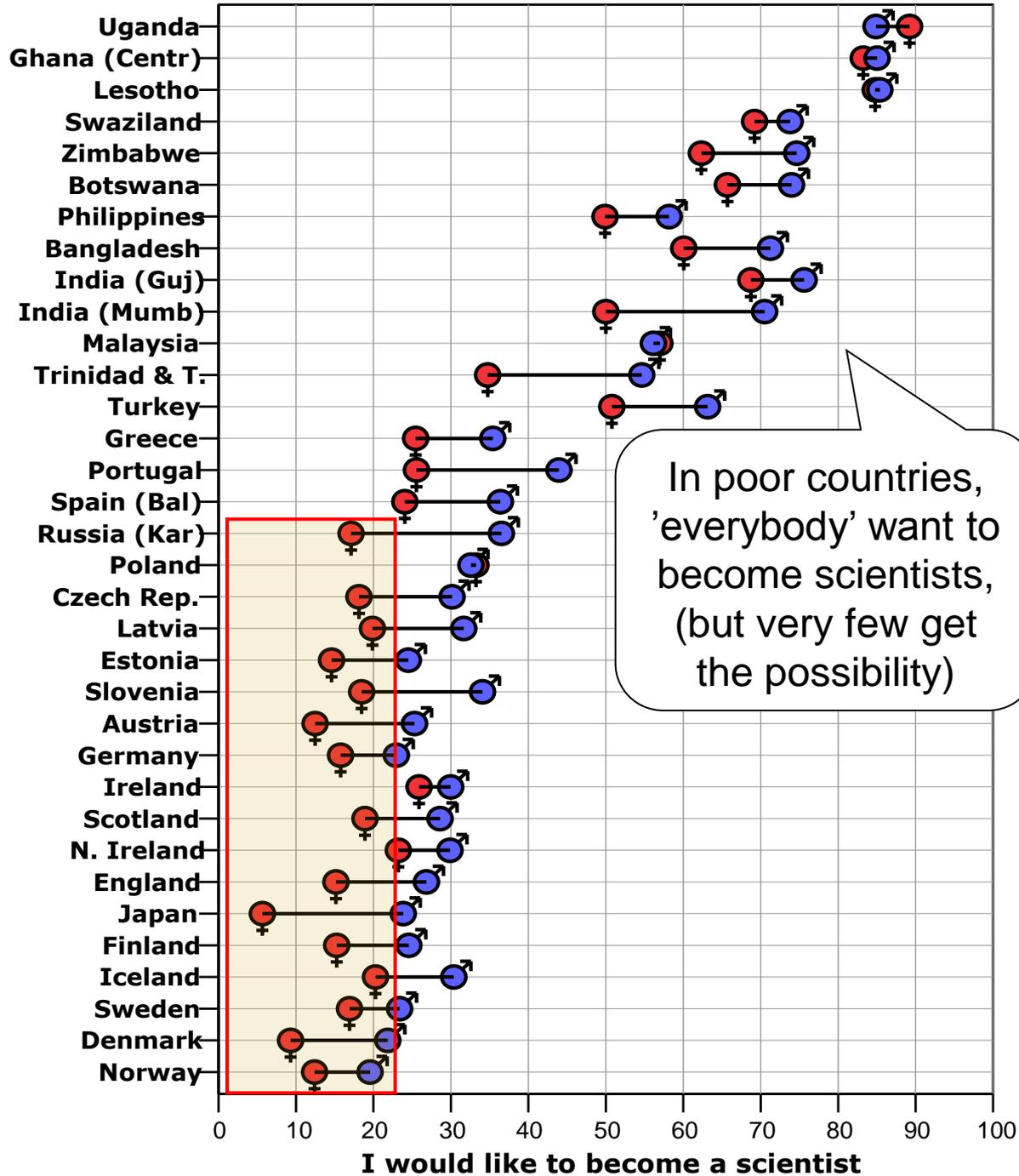
*Europe
needs
more
scientists*

Report by the High Level Group
on Increasing Human Resources for
Science and Technology in Europe
2004

SCIENCE AND SOCIETY

I would like to become a scientist

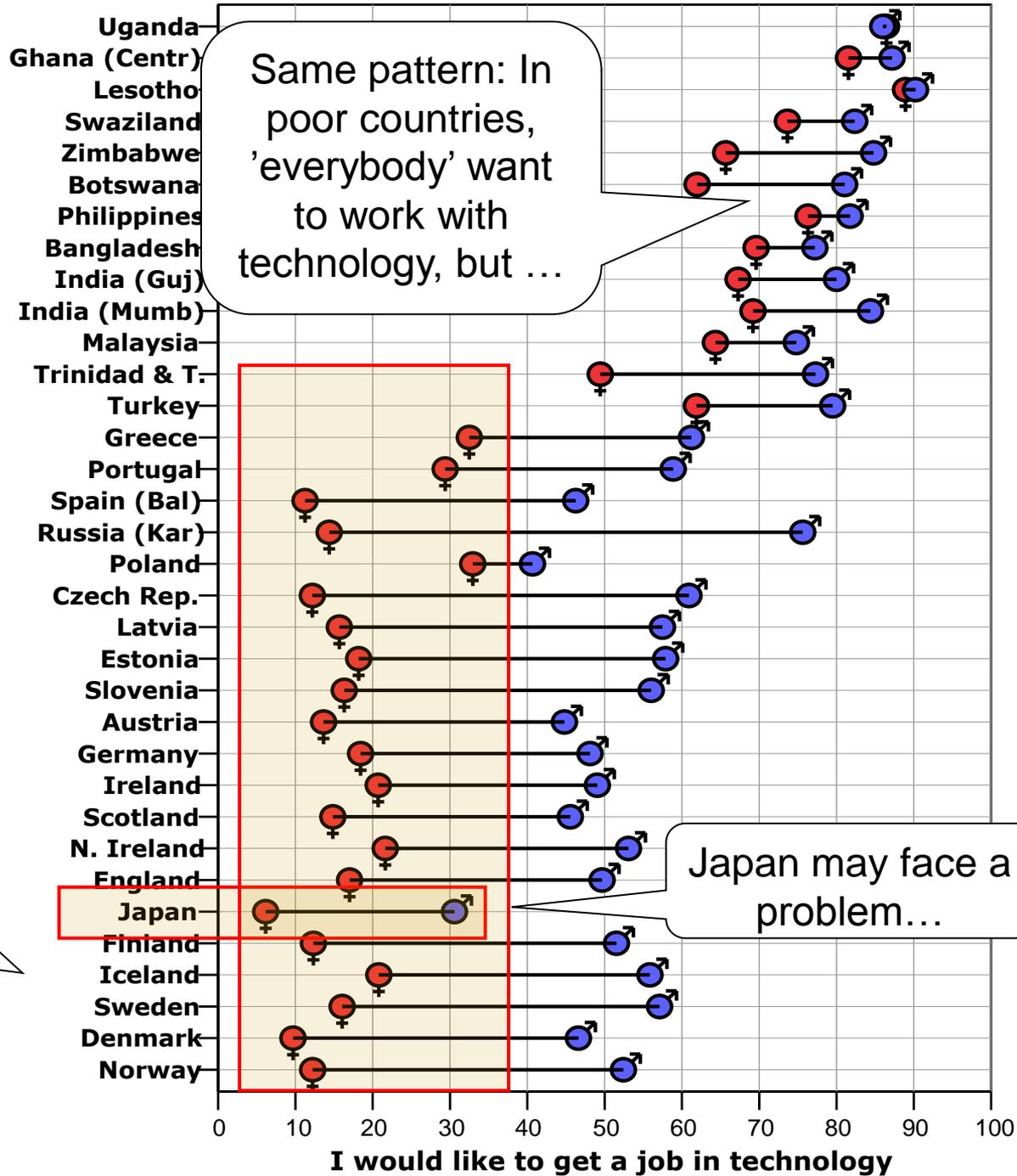
In wealthy countries, very few want to become scientists – in particular not the **girls**



In poor countries, 'everybody' want to become scientists, (but very few get the possibility)

I would like to get a job in technology

In wealthy countries, nearly no **girls** want to work with technology, and even **boys** are ambivalent



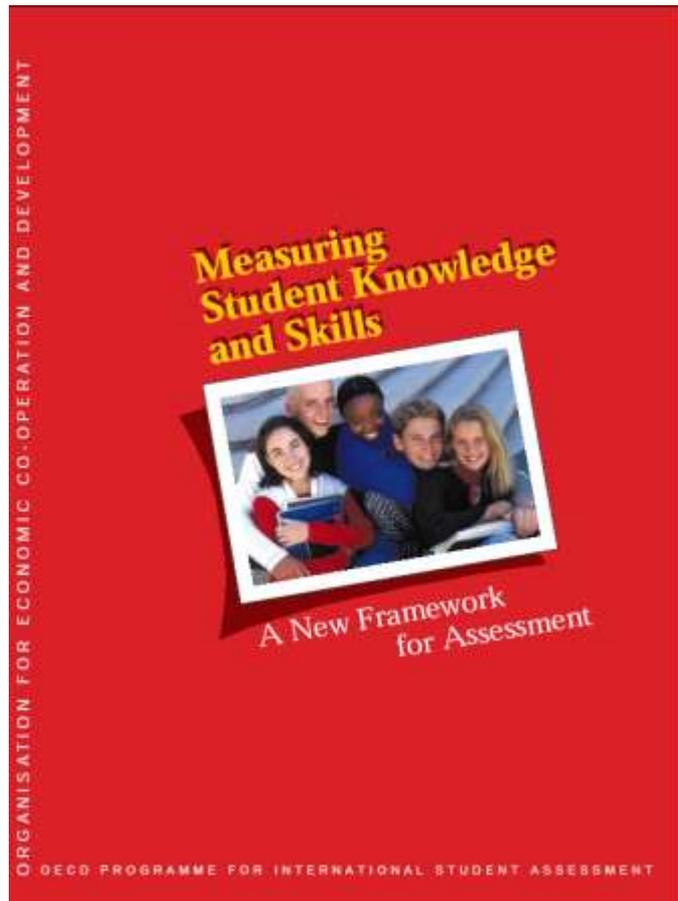
3. The curses of testing and ranking



- ❑ Partly created by OECD's PISA-project
- ❑ Creating competition among nations, schools, teachers and pupils
- ❑ Early testing kills curiosity and joy
- ❑ International testing creates panic – and causes ill-founded reforms
- ❑ Stressing the measurable, ignoring the essentials
- ❑ A pressure that runs against what science educators argue for:
 - ❑ A context-based and relevant science education
 - ❑ Active learning,
IBSE: Enquiry Based Science Education

PISA – Claiming to measure, 1999

- ❑ *How well are young adults prepared to meet the challenges of the future?*
- ❑ *Are they able to analyse, reason and communicate their ideas effectively?*
- ❑ *Do they have the capacity to continue learning throughout life?*
- ❑ **Repeated in all later reports**
- ❑ This is measured in a 2½ hour paper-and-pencil test, in solitude
- ❑ With items that are identical world-wide
- ❑ What a fantastic test...!!
- ❑ What a pity it is secret...



PISA testing: Mission impossible?



- ❑ **“Real life challenges”:**
(common for pupils in all 70 countries?)
- ❑ **“Real life situation”:**
2½ hours’ pen-and-pencil test
- ❑ **“Authentic texts”**
(i.e. published in one country, and then translated word by word to other languages)
- ❑ No country should be favored
(i.e. all local context, all current issues have to be removed. Controversial or socio-scientific contents removed)
- ❑ A test of loyalty and perseverance?
- ❑ Consider the (few) published items – and make your own judgment!

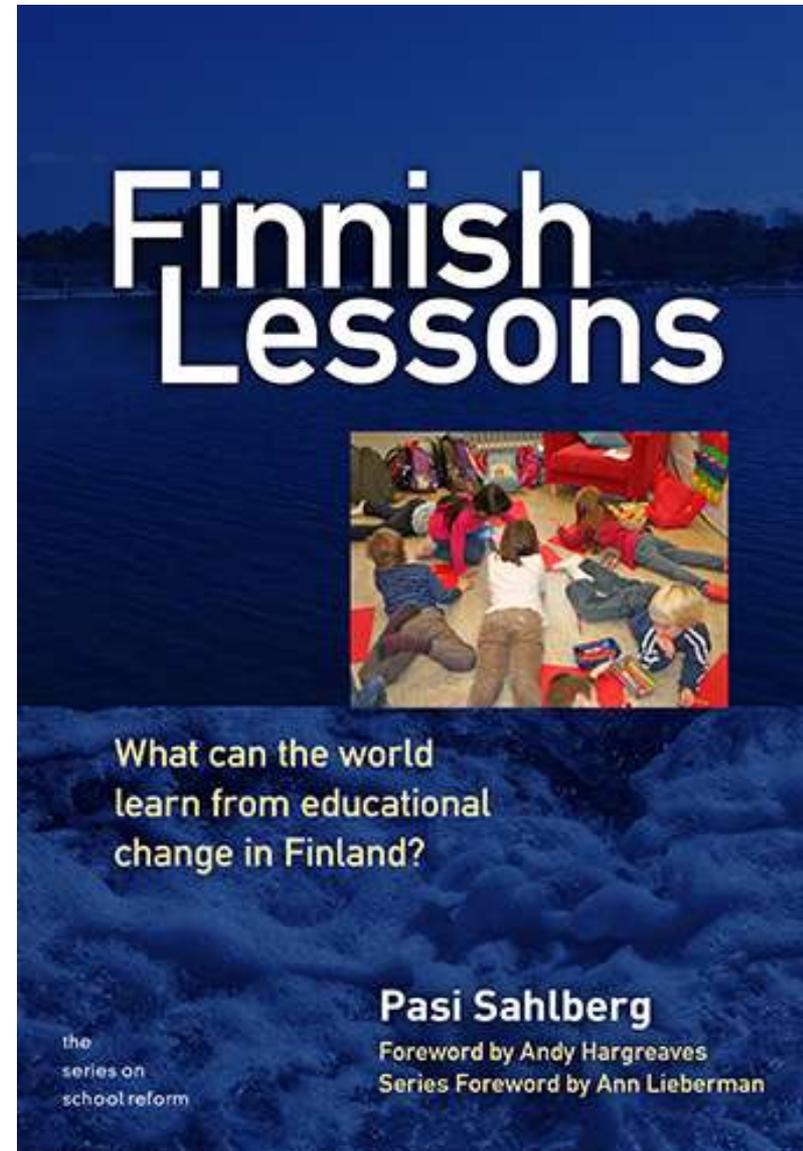
If PISA results are to be taken seriously, there are some **Problematic** results:

- ❑ More spending has no influence
- ❑ Class size does not matter
- ❑ High PISA score → low interest
- ❑ Traditional methods → higher scores
- ❑ Use of ICT → lower scores
- ❑ Experiments and practical work → lower scores
- ❑ Students formulating and pursuing their own ideas (Inquiry Based Science Education) → lower scores



Learning from Finland – the PISA winner?

- “PISA tourism” to Finland (a newcomer for foreign trade..)
- **Pasi Sahlberg** is a key actor in Finnish educational policy
- “**Finland** has remained immune to market-based educational reforms, New Public Management and other neoliberal policies”



Sahlberg: “GERM”:

Global Educational Reform Movement

- Increased competition and choice, standardization of teaching and learning
- frequent testing, test-based accountability, merit-based payment, ranking of schools and teachers
- Belief in education as a marketplace: privatization and competition and free choice of schools
- ***Finland has remained immune, but other countries have moved to adopt policies that are close to GERM***
(Sahlberg, p125)

NOW: International reactions from educators and academics

<http://oecdписаletter.org/>

- May 2014: Open letter to Andreas Schleicher /PISA/OECD from leading academics
- Now signed by 2200 academics from 40+ countries
- Published in the Guardian
- Initiative by *Noam Chomsky, Robin Alexander, Andy Hargreaves, Stephen Ball, Diane Ravitch etc.*

PISA-critique from leading academics

theguardian

OECD and Pisa tests are damaging education worldwide - academics

In this letter to Dr Andreas Schleicher, director of the OECD's Programme for International Student Assessment, academics from around the world express deep concern about the impact of Pisa tests and call for a halt to the next round of testing

The Guardian, Tuesday 6 May 2014



ool tests under attack as
sed of killing 'joy of learning'
from 12 countries including UK call for next
tests on 15-year-olds to be scrapped

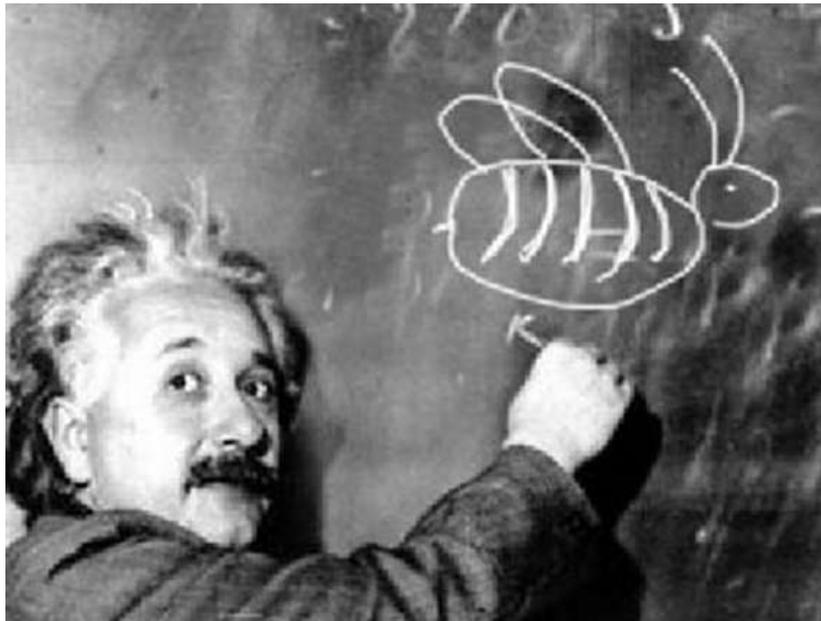
Sozialisation
Vorgang-

times to league tables

'imperfect' be

What did Einstein say about PISA?

- *Everything that can be counted does not count; and..*
- *everything that counts cannot be counted.*
 - Albert Einstein (physicist, philosopher and artist)



Conclusions (and beginnings?)

- All students want something meaningful, interesting, something that fits their values and identities
- But (in the more developed countries) they do **not** think that they can find this in S&T studies and careers
- **Our challenge for recruitment and for a sustainable science culture:**
- Bridge the mismatch between youth culture and the (perceived) culture and nature of S&T
- How can we address this problem –
 - **Without distorting the real nature S&T?**
 - **And without *cheating* the young?**

Thank you!

**I am happy to share
documentation and data**