



18<sup>TH</sup> OECD/JAPAN SEMINAR

# EDUCATION 2030

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INSIDE: A 14-PAGE SPECIAL REPORT ON TECH STARTUPS

The  
Economist

JANUARY 18TH-24TH 2014

Economist.com

If the French ran America  
China cracks down on microblogs  
New opportunities for organised crime  
Regulators go soft on Europe's banks  
Google and the internet of things

**Coming to an office  
near you...**

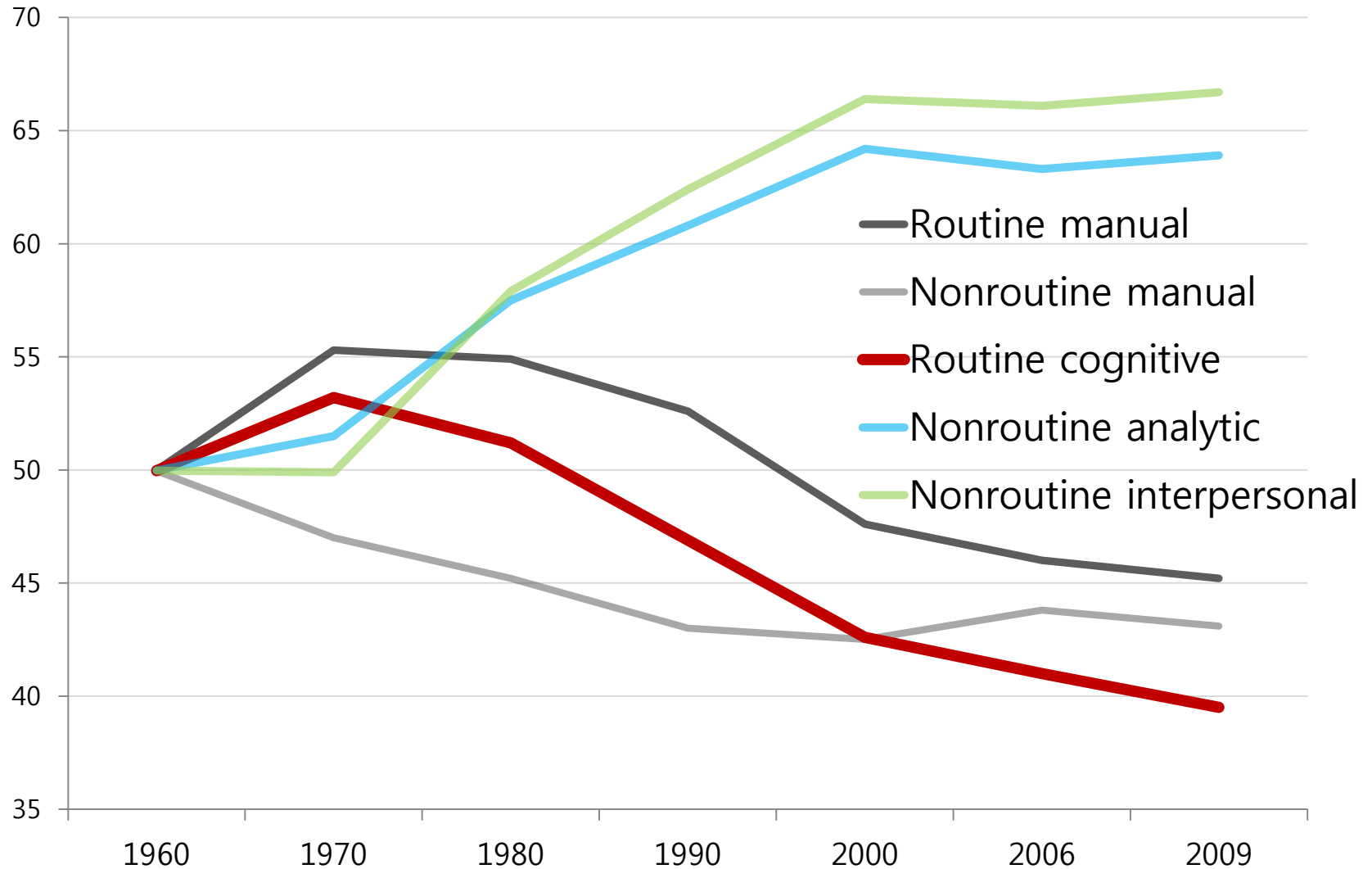
What today's  
technology will do to  
tomorrow's jobs

**The kind of things that  
are easy to teach are  
now easy to automate,  
digitize or outsource**

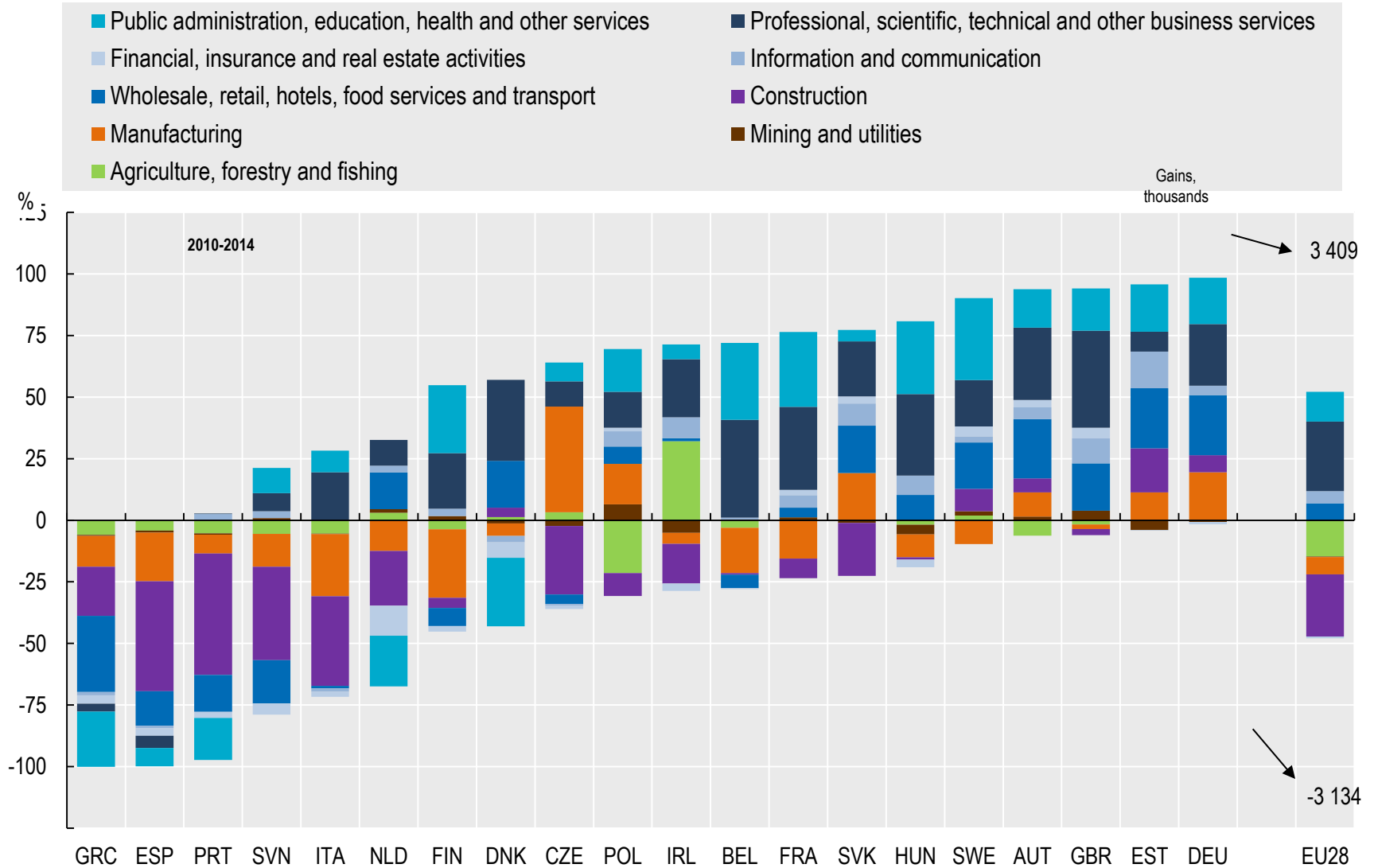
# Changes in the nature of work

Trends in different tasks in occupations (United States)

Mean task input in percentiles of 1960 task distribution



# Where people lost and gained jobs between 2010-14

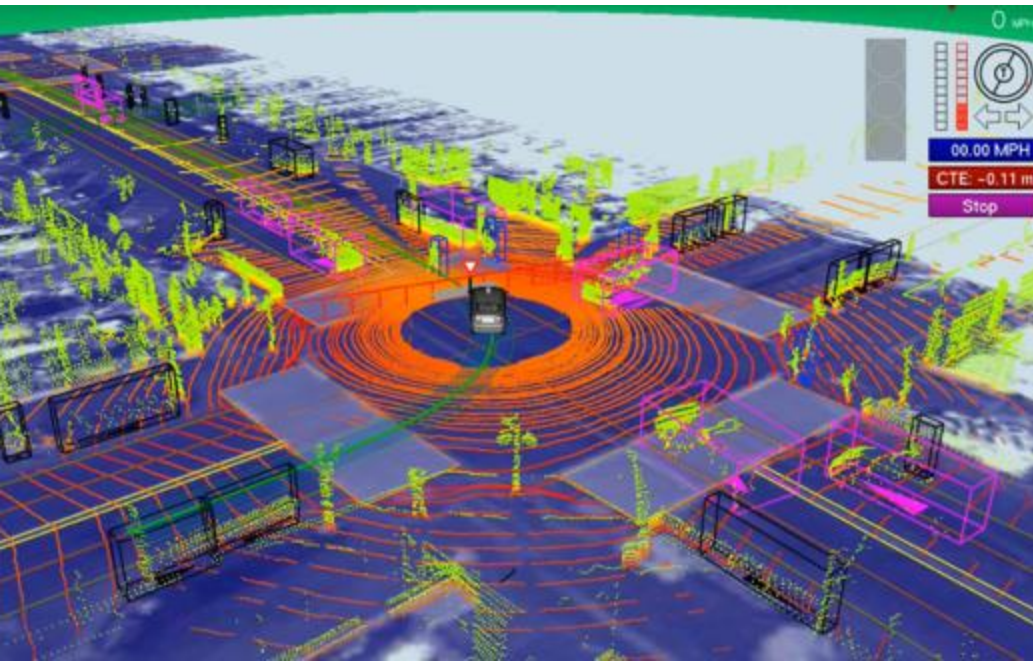


# Robotics



# Google Autonomous Vehicle

>1m km,  
one minor accident,  
occasional human intervention







TomTom has 5 trillion data points on traffic, adding 6 billion per day.



BMW cars have 50 sensors, 7 cameras, could recognize open parking spots for other cars



GE expects to connect all its machines to the Internet, making them "smarter" and more efficient



Tesco exploits data on more than 100 market baskets a second and 6 million transactions a day



# ...unleashing firms that gain “scale without mass” ...



- 50\$B in sales,
- 54 000 employees,
- 1m / employee



US Average = 120k / employee



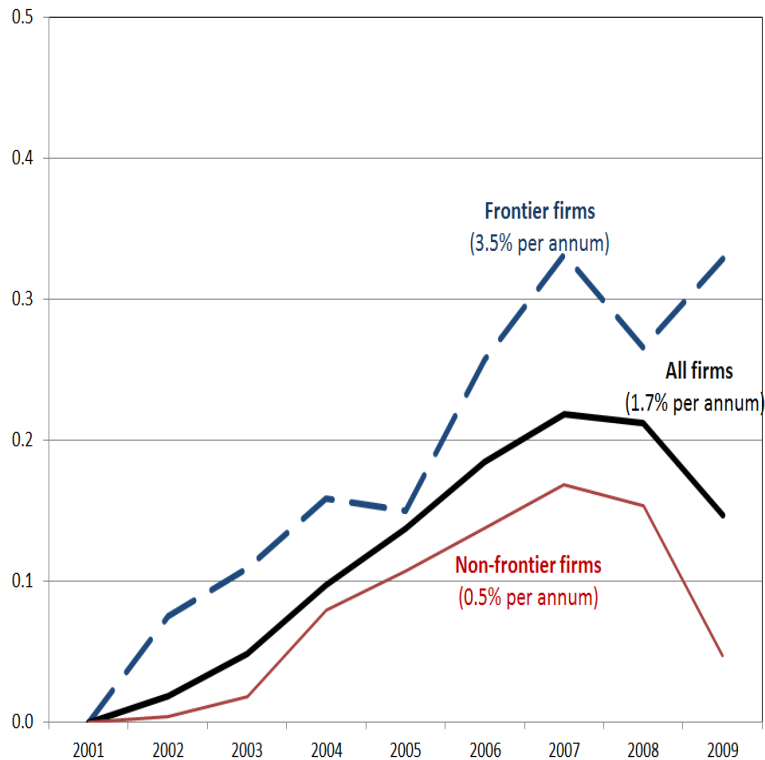
- 70\$B in sales
- 110 000 employees
- 600k / employee



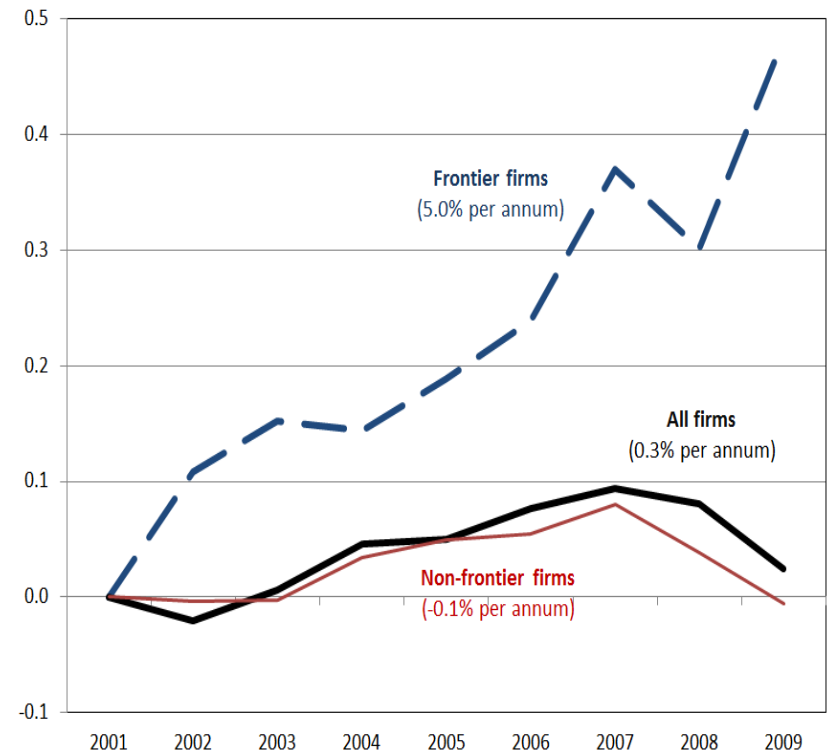
200k / employee

## Labour productivity growth (2001 = 100)

### Manufacturing

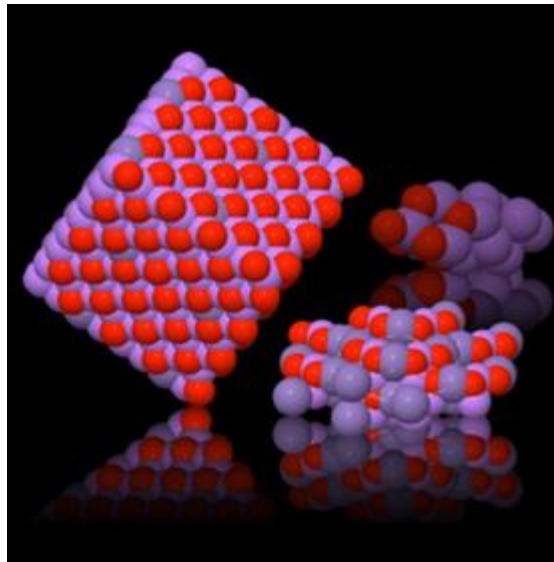
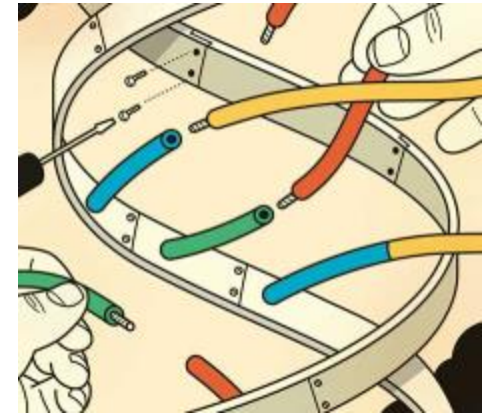


### Services



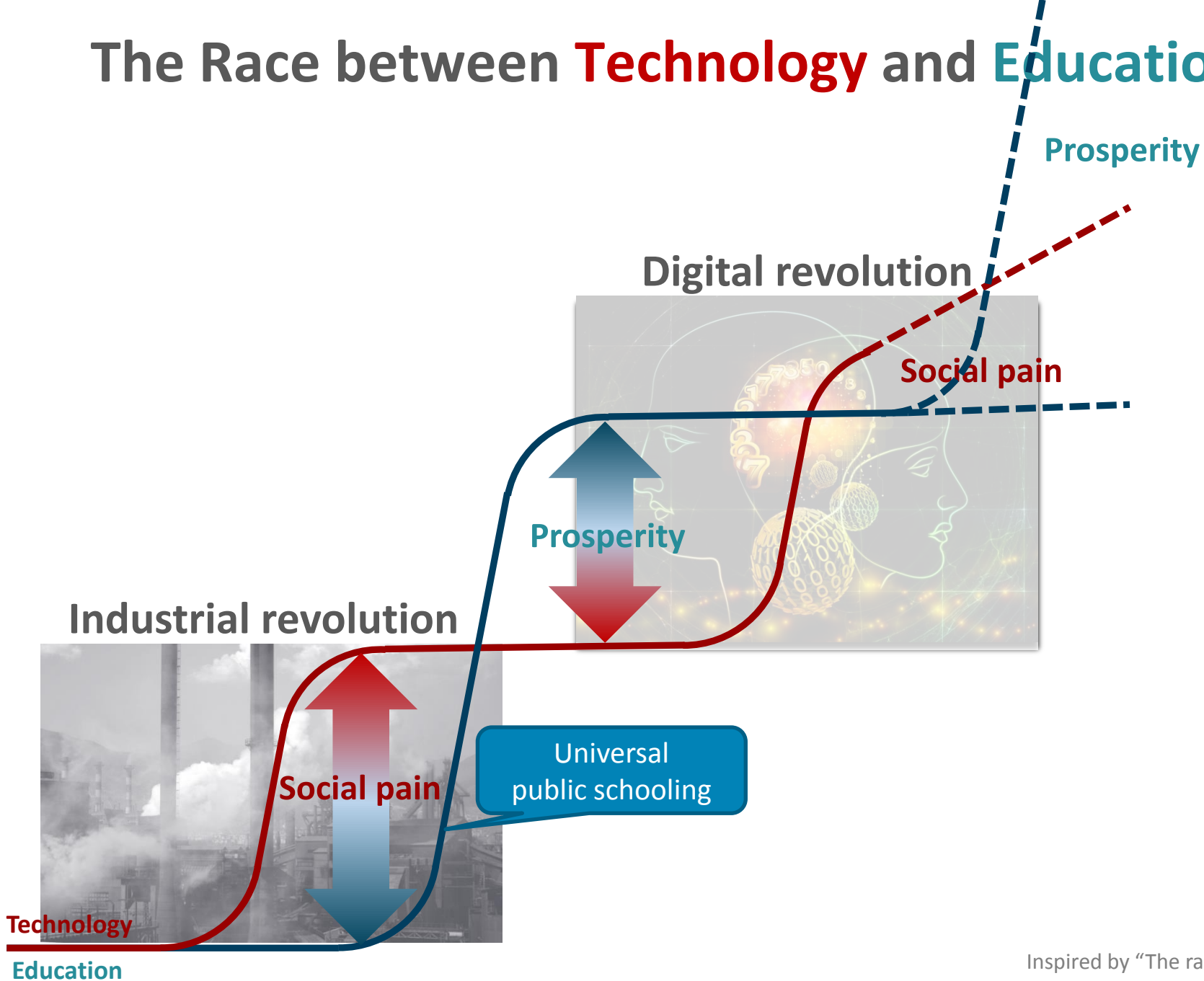
# A lot more to come

- 3D printing
- Synthetic biology
- Brain enhancement
- Nanomaterials
- Etc.



Inspired by: Center for curriculum redesign (CCR)

# The Race between **Technology** and **Education**

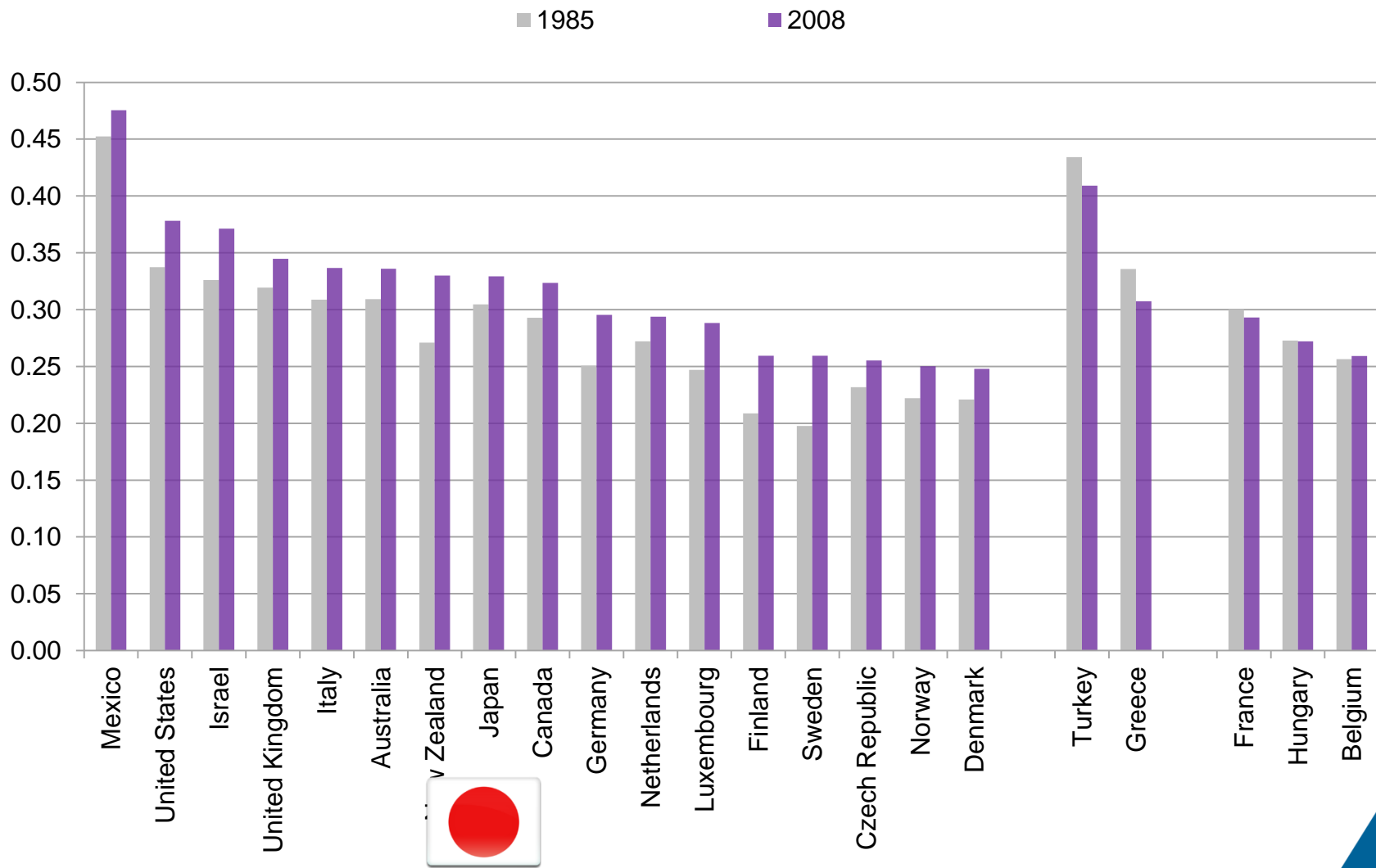


Inspired by "The race between technology and education"  
Pr. Goldin & Katz (Harvard)



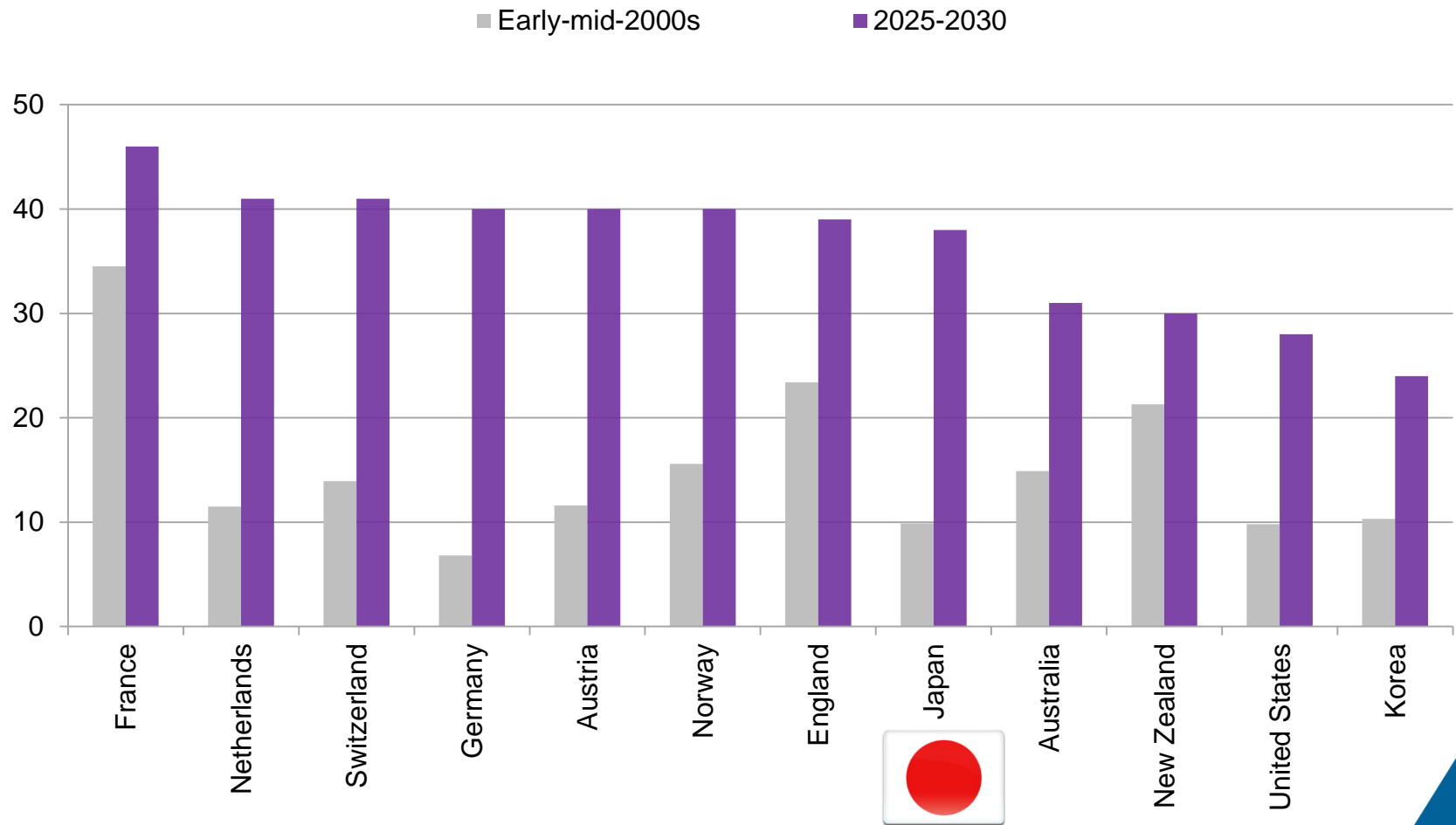
# Growing unequal

Gini Coefficients for OECD countries, in 1985 and 2008



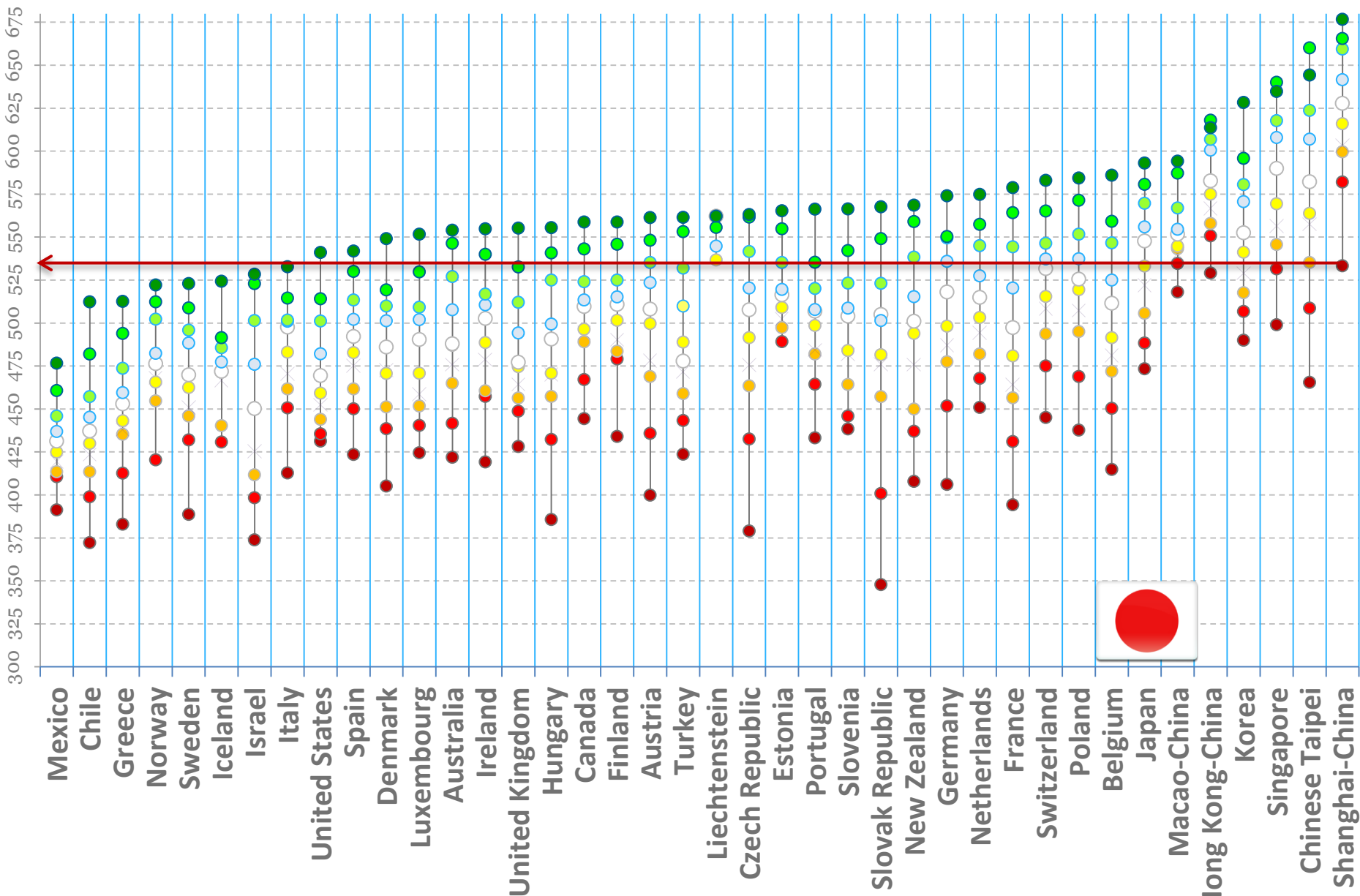
# Home alone: the rise of single-person households

Number of one person households early-mid-2000s to 2025-2030 (projected)



# Poverty is not destiny

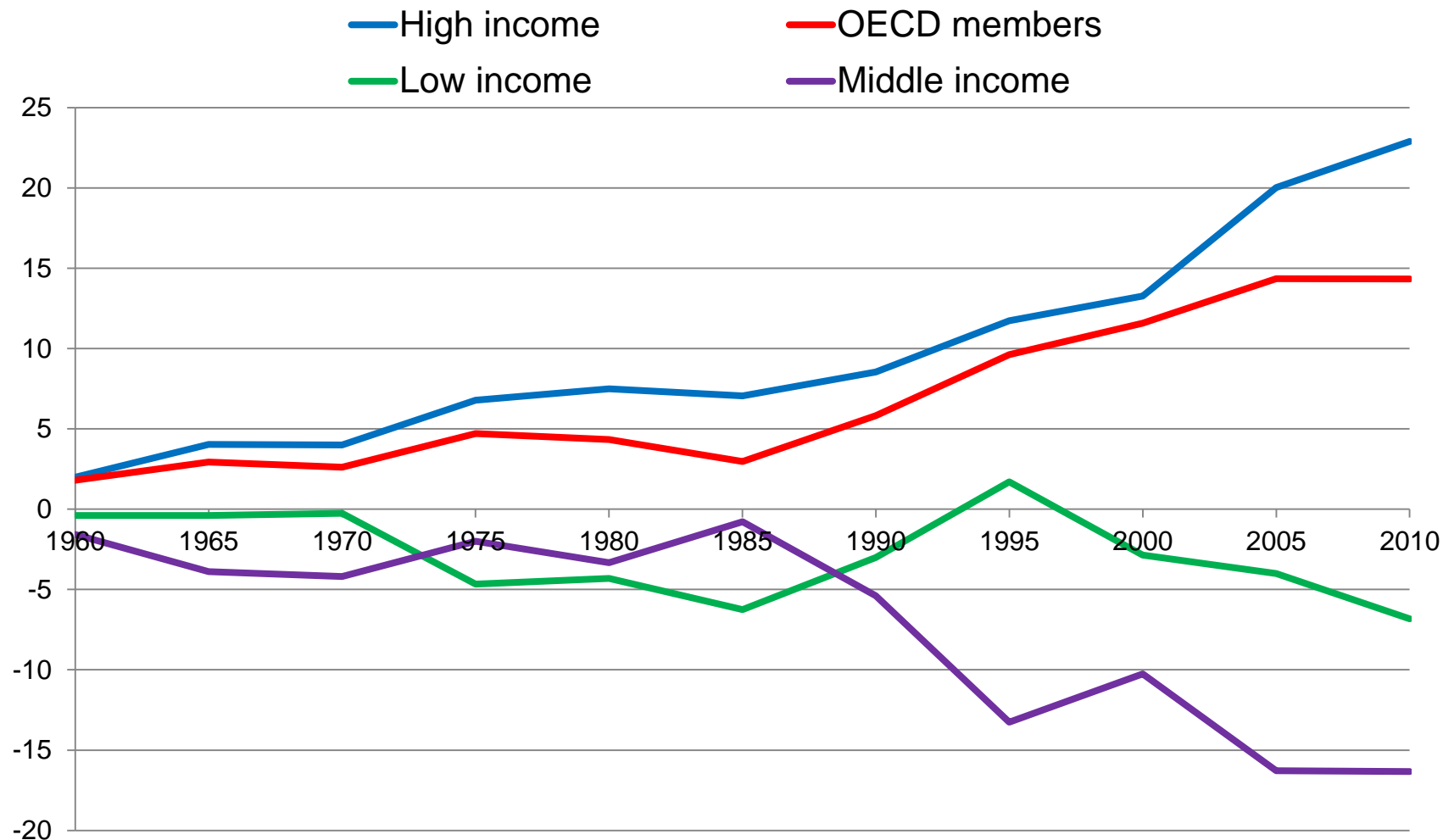
## PISA math skills of 15-year-olds by decile of social background





# Increasing migration towards the developed world

Net migration (in millions of people) into regions, with countries grouped by income level and OECD members, 1960-2010.



Source : OECD (2013), Trends Shaping Education.

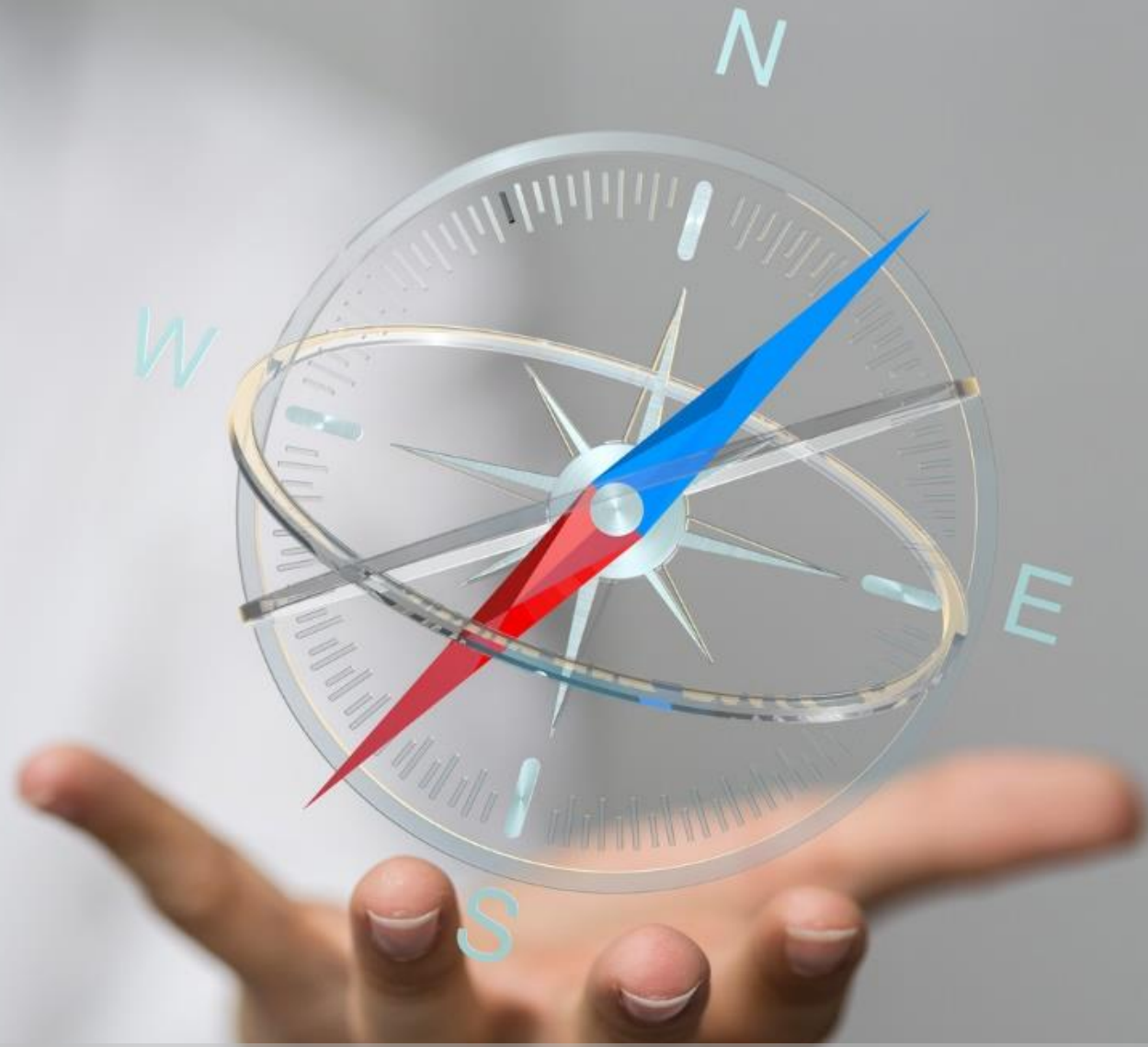
Primary source: World Bank (2012), *World Databank: Net Migration*.



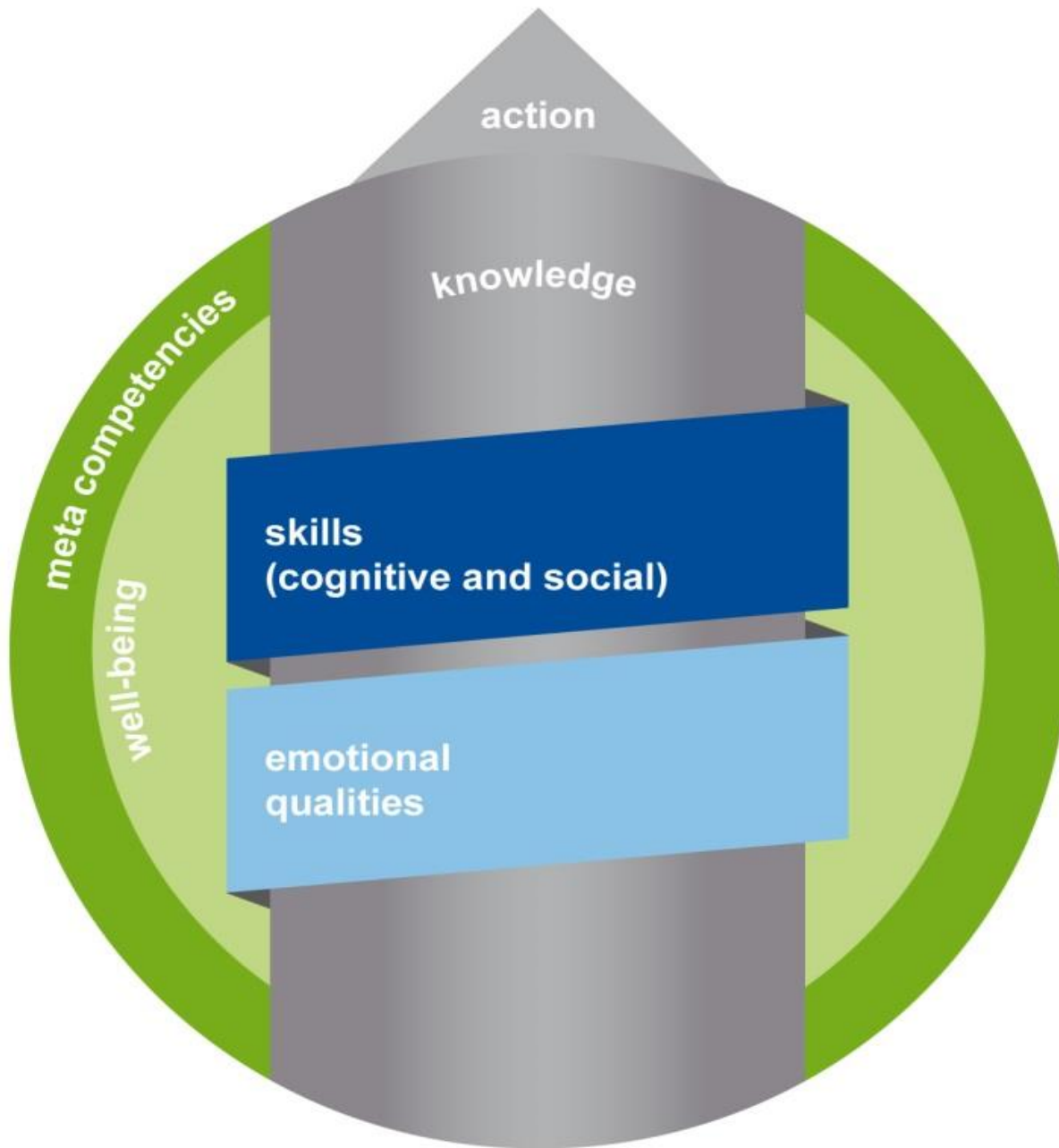
**What does all this mean for education?**



Education in the past



**Education 2030**





# Knowledge

Concepts, processes, methods, tools

# Examples of disciplinary knowledge

Reading,  
writing

Mathematics

Natural  
sciences

Social sciences

Foreign  
languages

History

Economics,  
politics and law

Geography

Art

Physical  
education,  
health  
education

# Math teaching $\neq$ math teaching

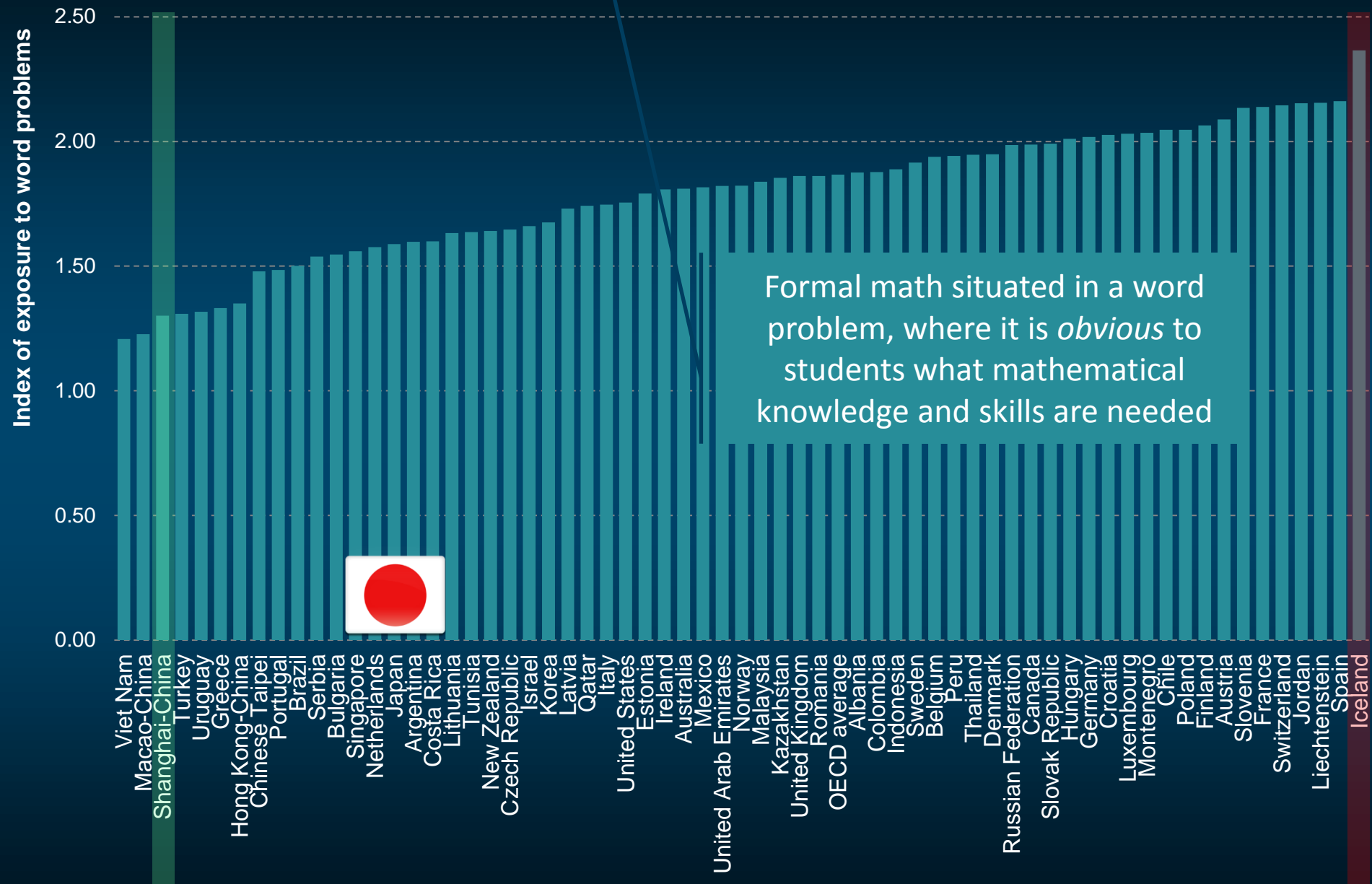
PISA = reason mathematically and understand, formulate, employ and interpret mathematical concepts, facts and procedures



# Focus on word problems



Fig I.3.1a



Formal math situated in a word problem, where it is *obvious* to students what mathematical knowledge and skills are needed

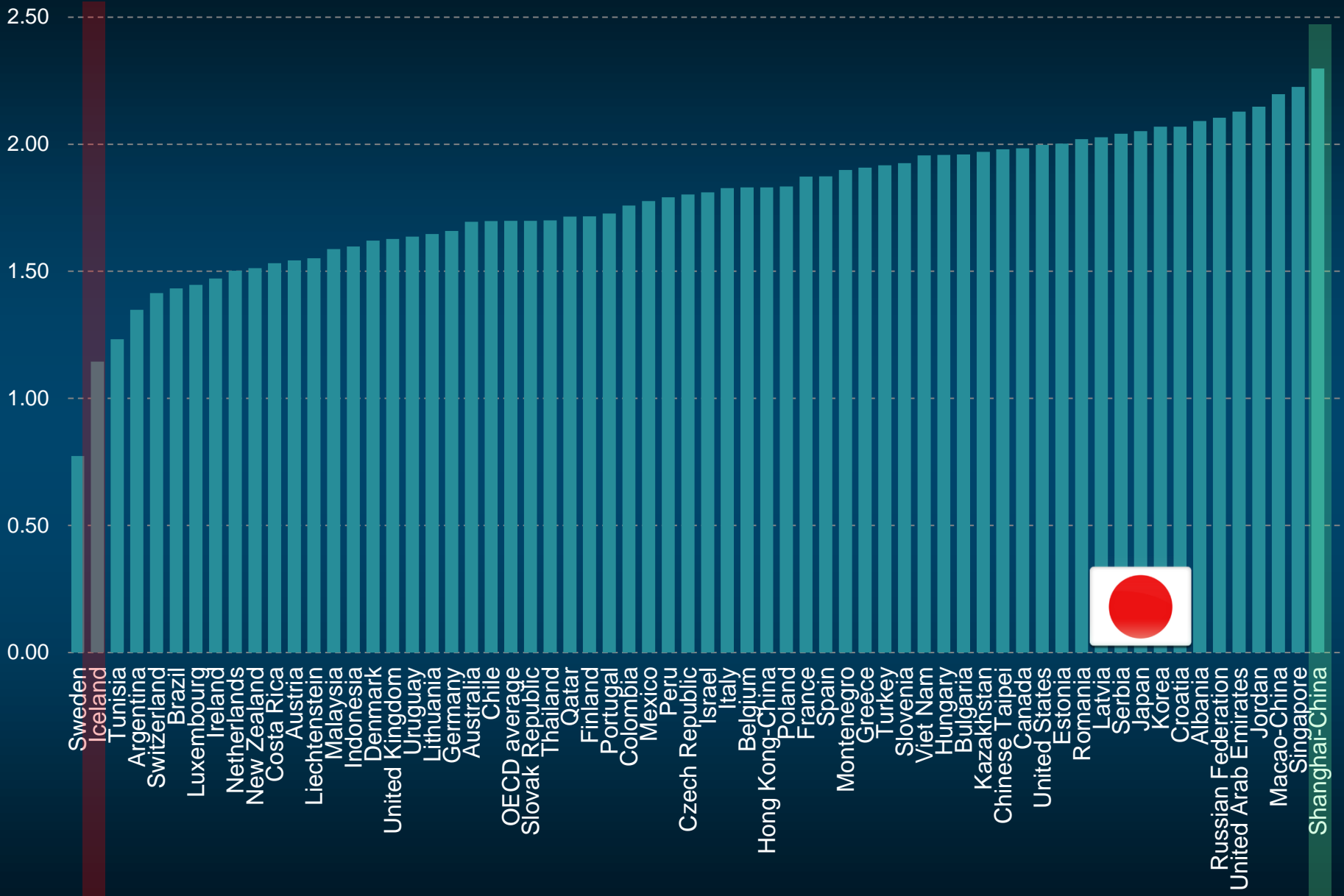


# Focus on conceptual understanding



Fig I.3.1b

Index of exposure to formal mathematics



# Examples of interdisciplinary knowledge

**Financial literacy**

**Cultural literacy/  
intercultural  
literacy**

**Global knowledge**

**Entrepreneurship,  
Business,  
Economics**

**ICT literacy**

**Media literacy**

**Ecology,  
environmental  
literacy**

**STEM**

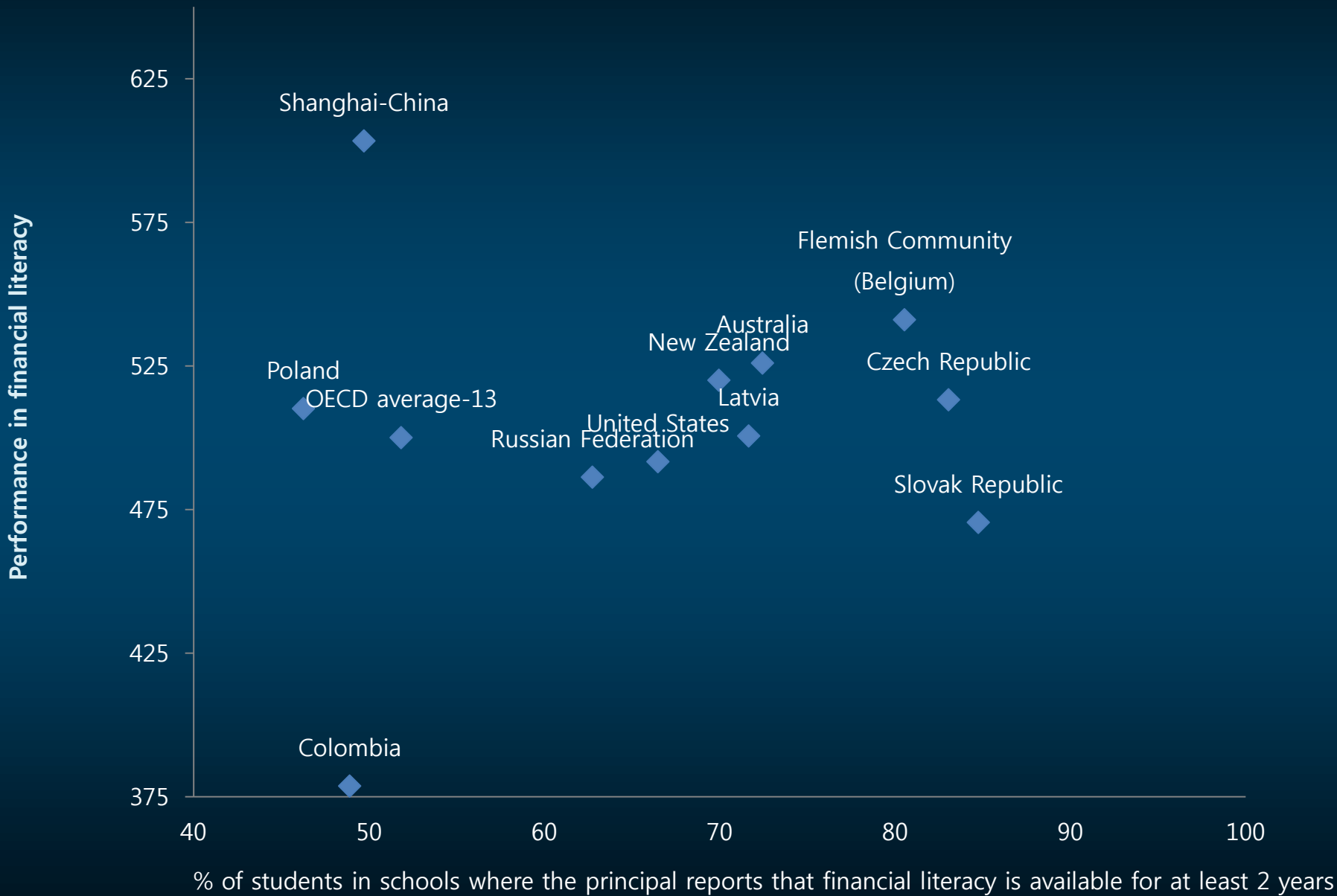
**Programming**

**Engineering**

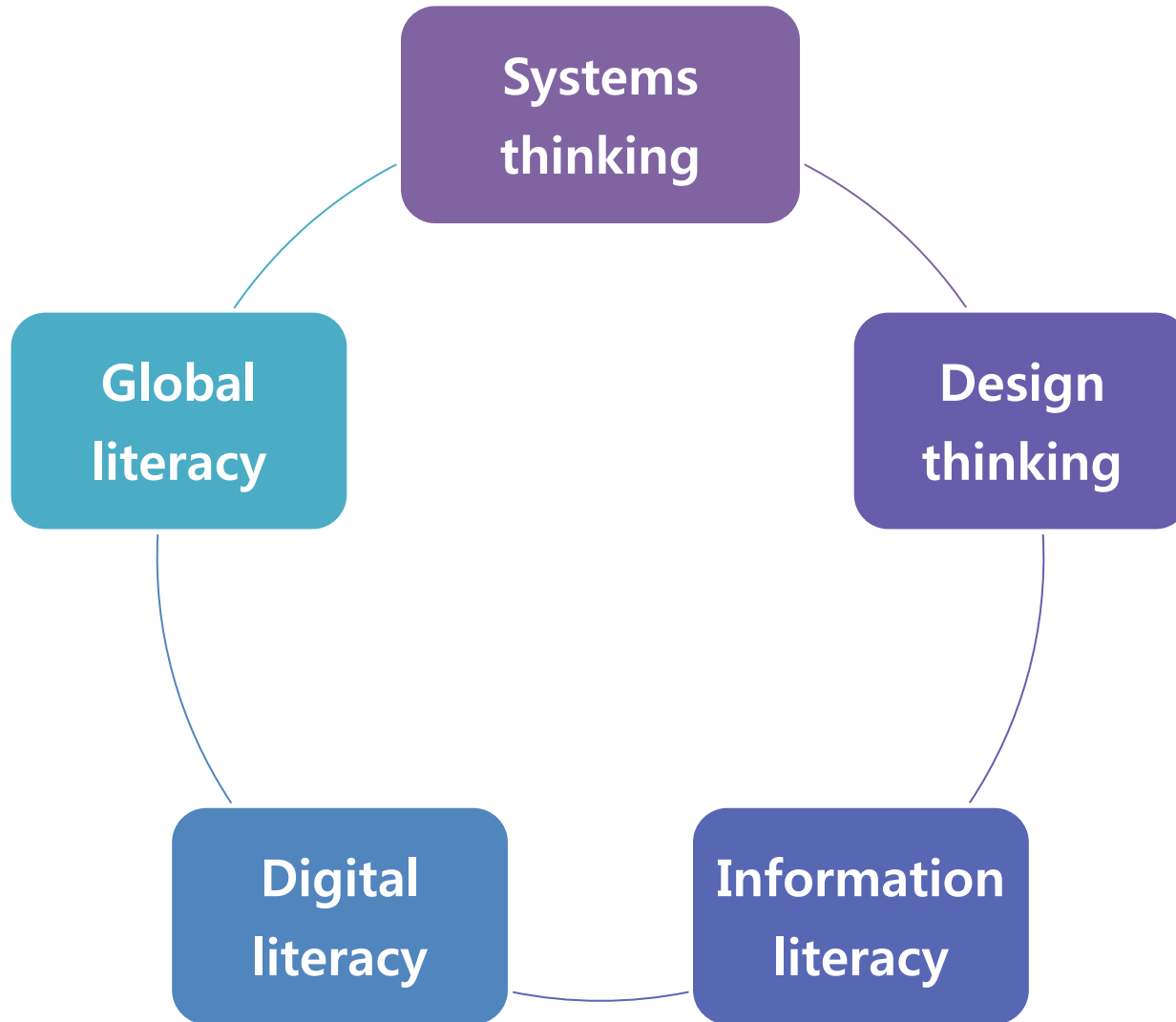
**Robotics**

**Practical/  
vocational-related  
knowledge**

# Exposure and financial literacy



# Some examples of themes in which knowledge can be developed



# Selecting and prioritising what students should learn



**Emotional**

(e.g. beauty)

**Cognitive**

(e.g. creativity, critical thinking)

**Disciplinary/practical use**

(e.g. relevance to application in work and life)





**Cognitive competencies**



# Examples of cognitive competencies

**Problem Solving**

**Creativity**

**Critical Thinking**

**Analytical skills**

**Innovation**

**Synthesising**

**Systems thinking**

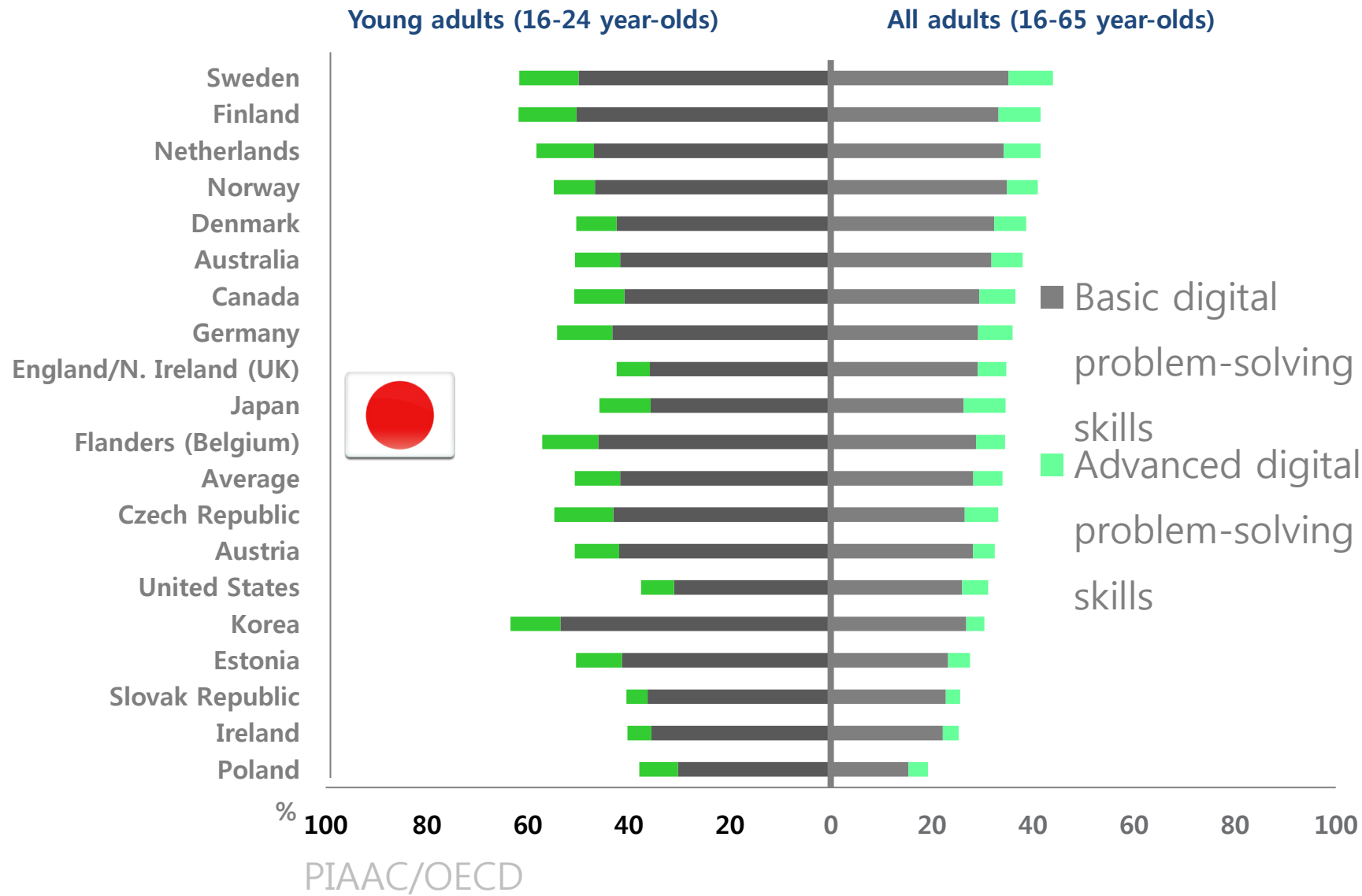
**Researching**

**Foresight thinking**

**Higher order thinking skills**

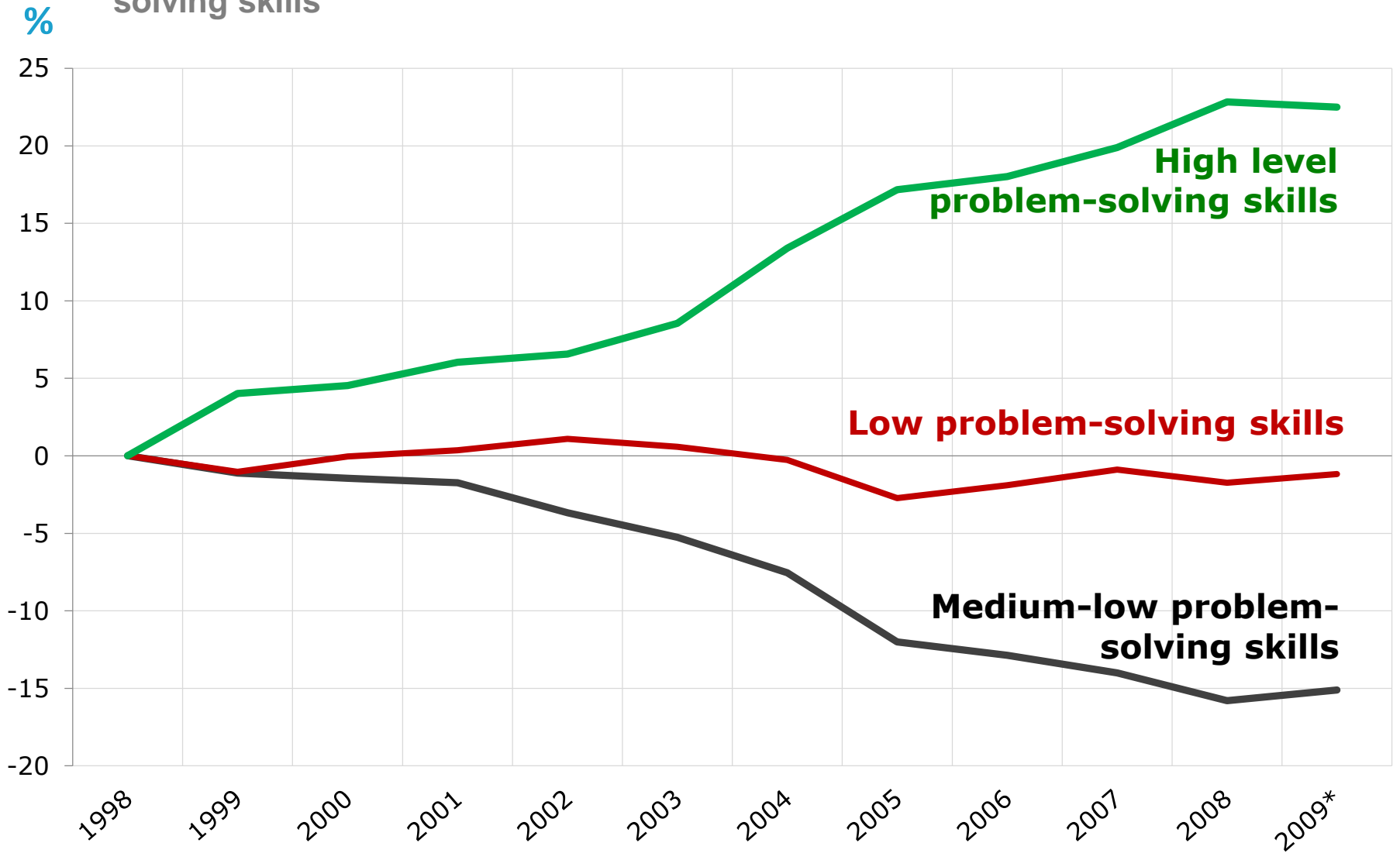
**Data gathering**

# Digital problem solving skills of adults



# Average is over

Evolution of employment in occupational groups defined by problem-solving skills





**Social competencies**

# Examples of social Competencies

**Collaboration**

**Cross cultural  
skills**

**Communication**

**Team work**

**Conflict  
resolution skills**

**Leadership**

**Collaborative problem solving competency is the capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution.**

# Global Competence in PISA 2018

**Global Competence is the capability and disposition to act and interact appropriately and effectively, both individually and collaboratively, when participating in an interconnected, interdependent and diverse world.**



**Physical competencies and well-being**



# Physical Competencies and Well-being

**Subjective health**

**Health habits (good nutrition; making good choices about sleep and exercise)**

**Kinesthetic ability (the ability to coordinate movement) dexterity, motor skills**

**Risk-avoidance behaviours (avoiding substance abuse, smoking, drinking, unsafe sexual practices, and violence)**

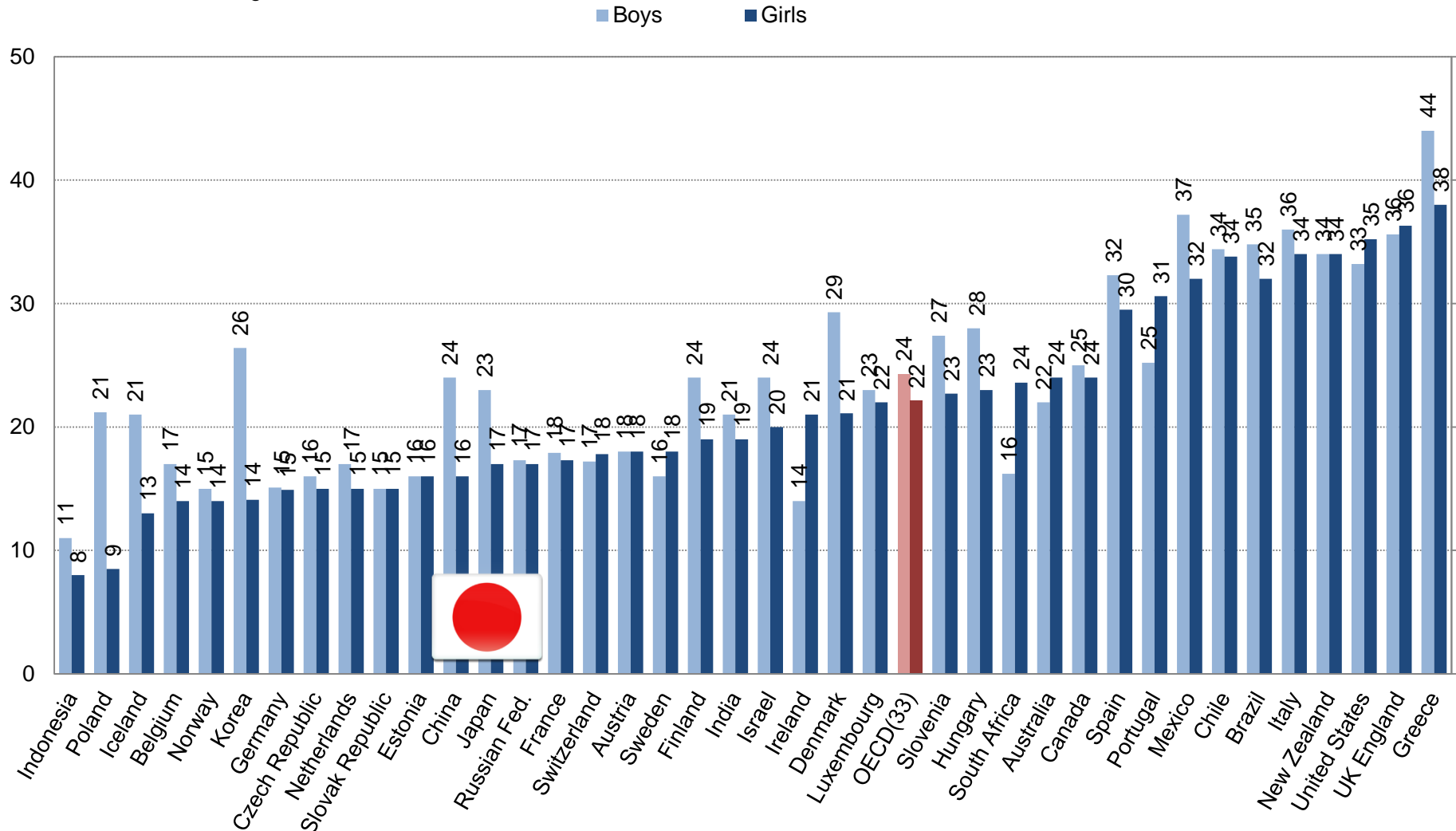
**Health outcomes (e.g. obesity, body-mass index – BMI)**

**Ability to use physical tools, operations, functions including manual skills (ICT, new machines)**

# Overweight and obesity among children

## Measured overweight (including obesity) among children, 2013 (or latest year)

% of children at various ages



Source: World Obesity Federation (2015), KIGGS (2003-06) for Germany and KNHANES (2013) for Korea.



**Character qualities**

# Some examples of character qualities

Empathy

Resilience

Mindfulness

Inclusion

Curiosity

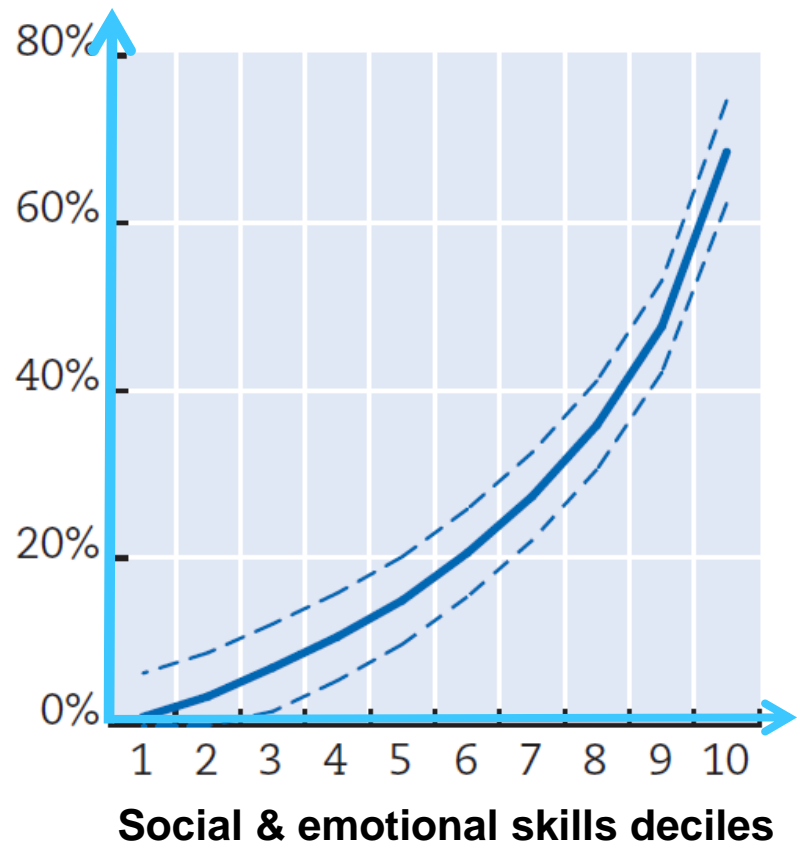
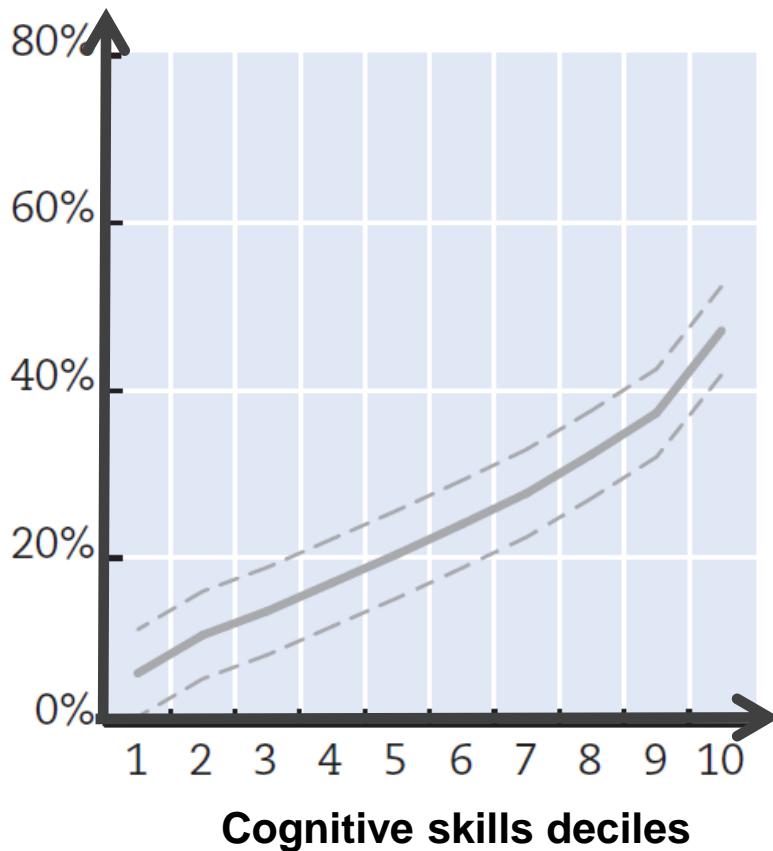
Ethics

Courage

Leadership

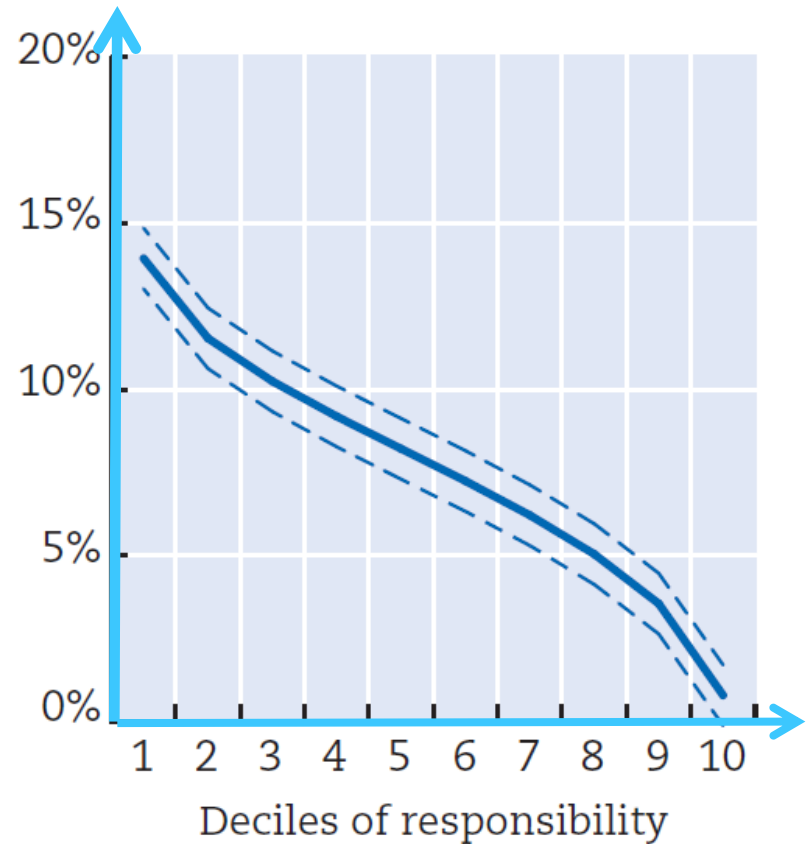
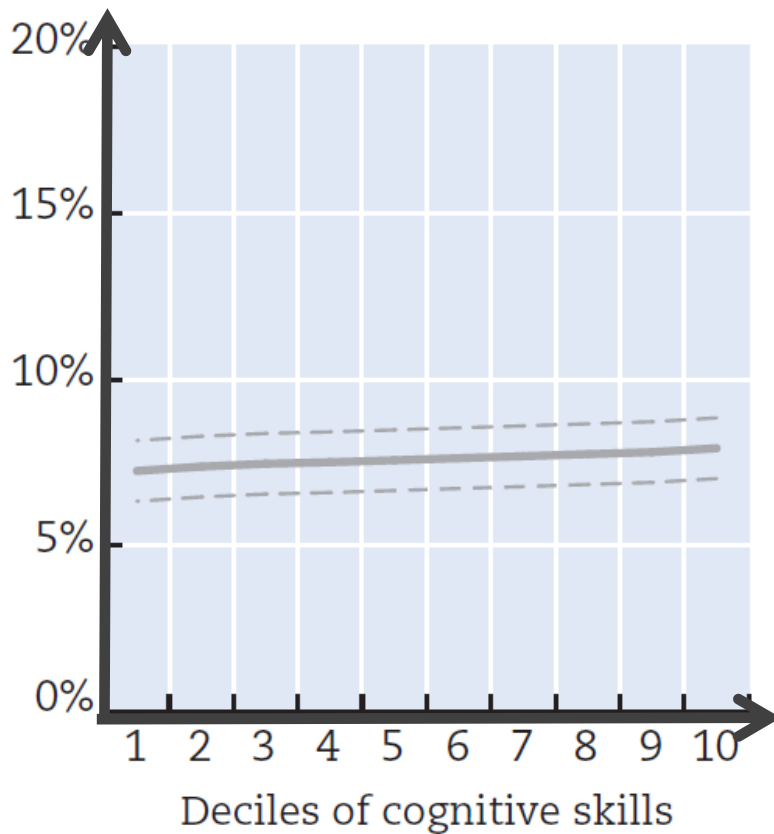
# College Completion (USA)

Source: NLS  
Y



# Bullying at 15 (Korea)

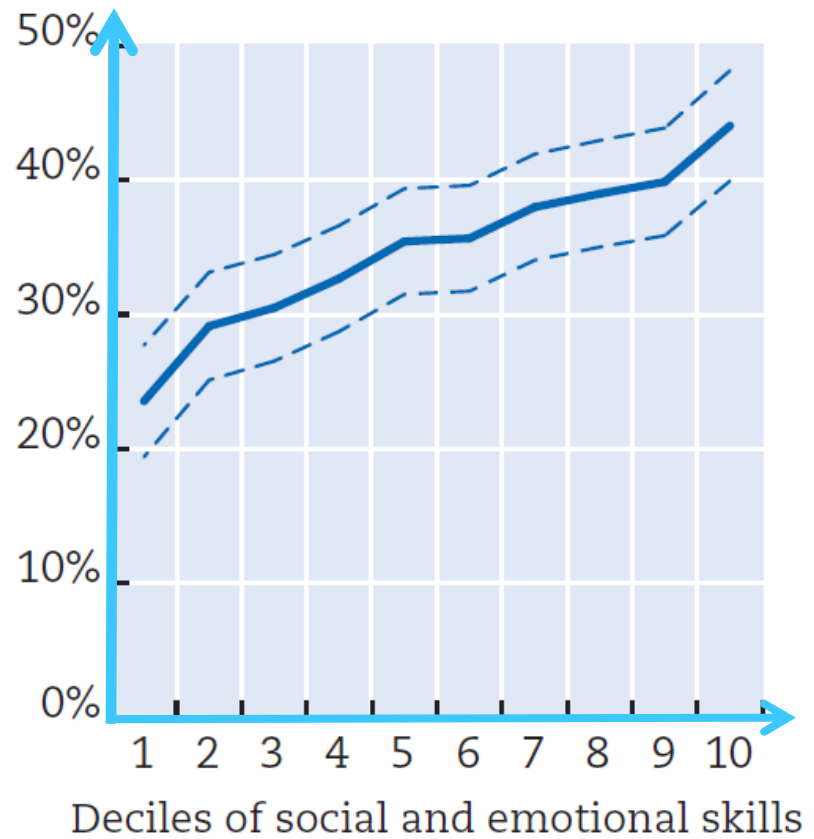
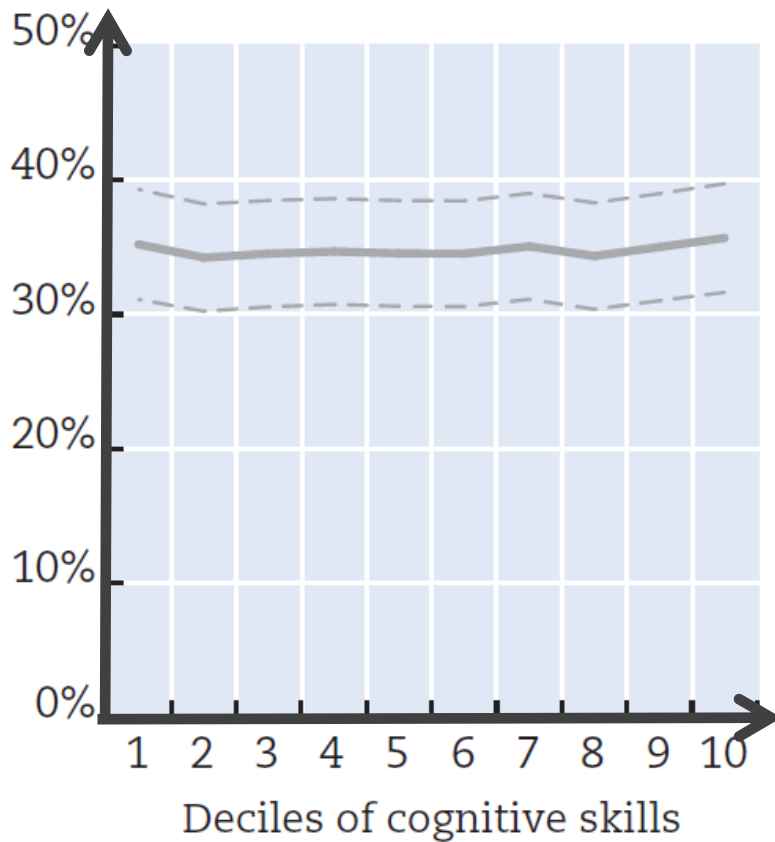
Source: KYP  
S



OECD (2015)

# Happy at 20 (New Zealand)

Source: CC



# Country of origin and country of destination

## Immigrant students' PISA performance by country of origin and destination

■ First-generation immigrants' score, after accounting for s

Students from Arabic-speaking countries in:

- Netherlands
- United Arab Emirates
- Denmark
- Finland
- Qatar

## Percentage of students with an immigrant background who reported that they feel like they belong at school

Students from Arabic-speaking countries in:

- Finland
- Netherlands
- United Arab Emirates
- Qatar
- Denmark

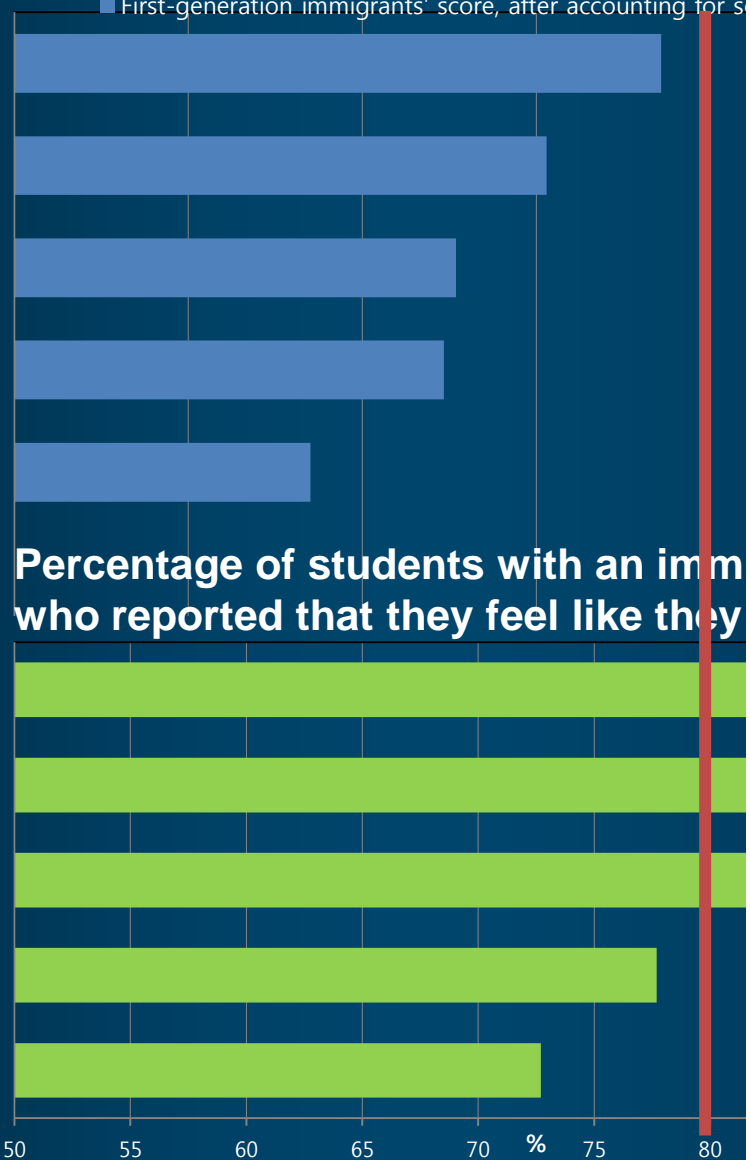
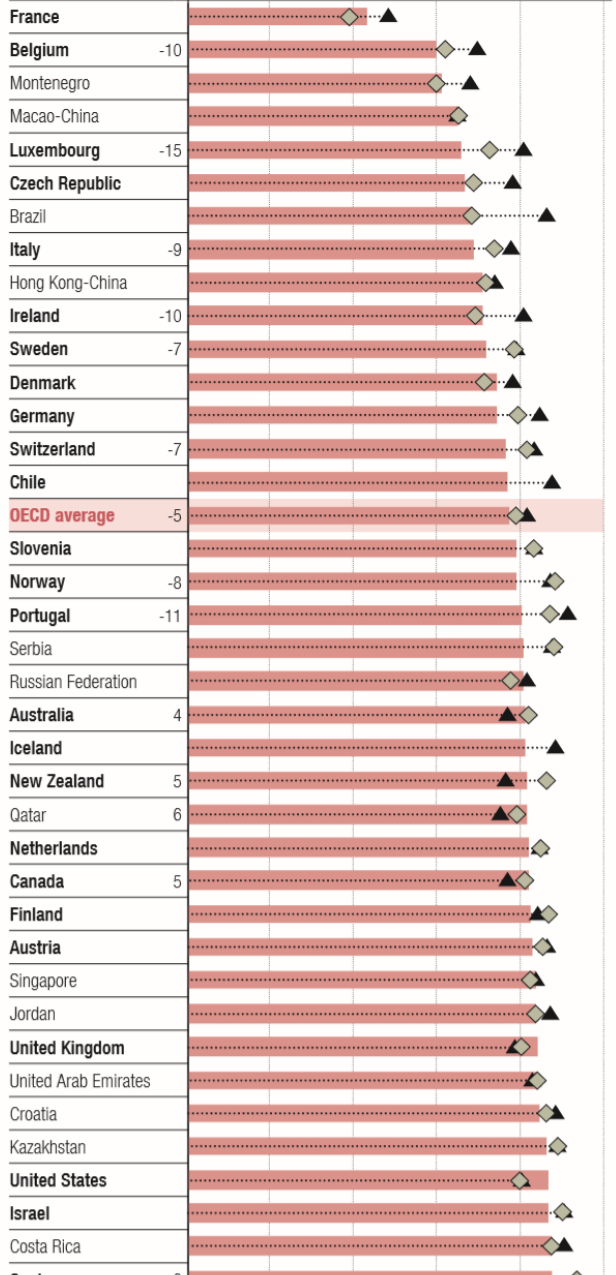


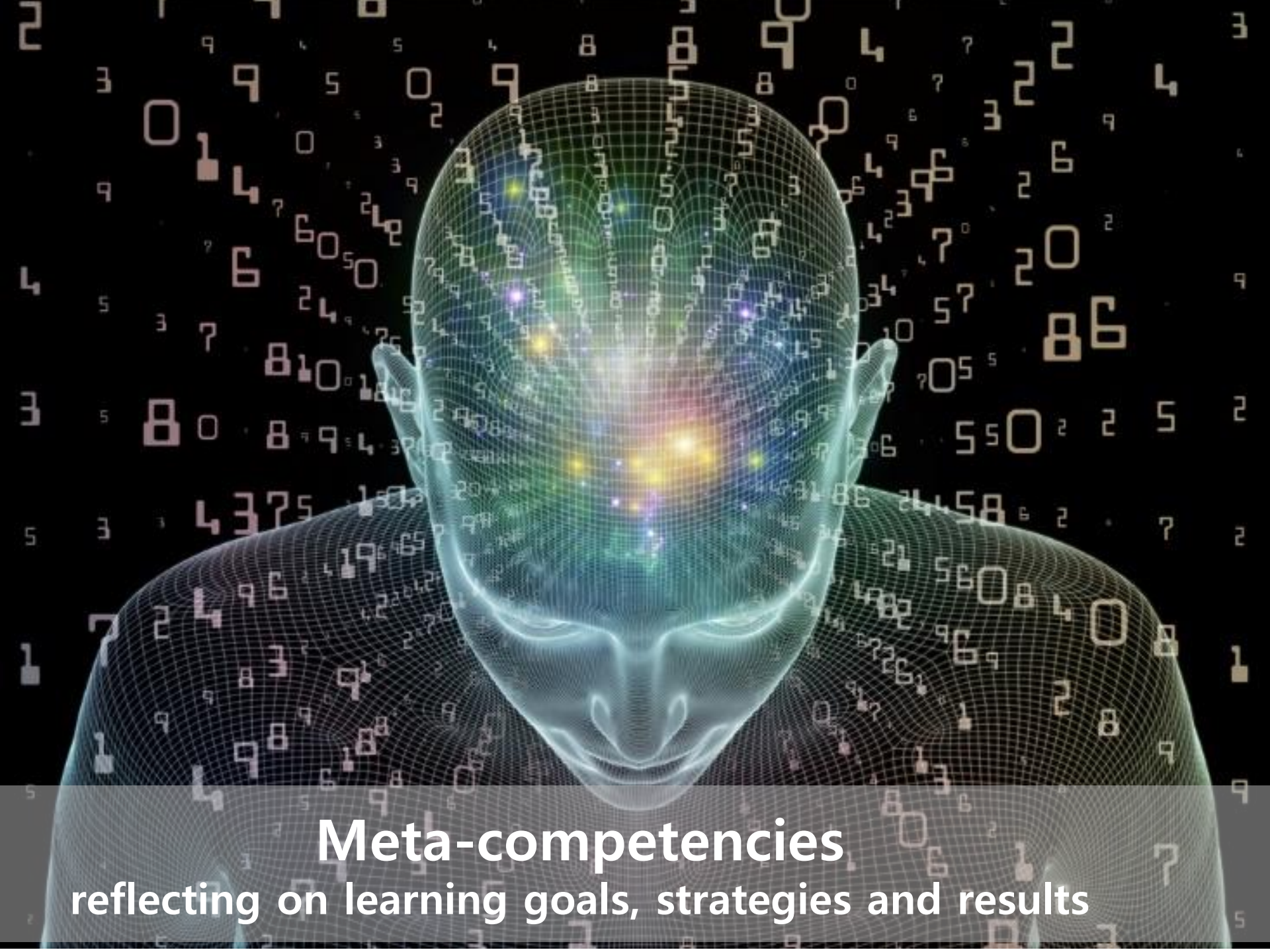
Figure 4: Sense of belonging at school, by immigrant background

Percentage of students who reported that they feel like they belong at school

■ First-generation immigrant | ◆ Second-generation immigrant | ▲ Non-immigrant







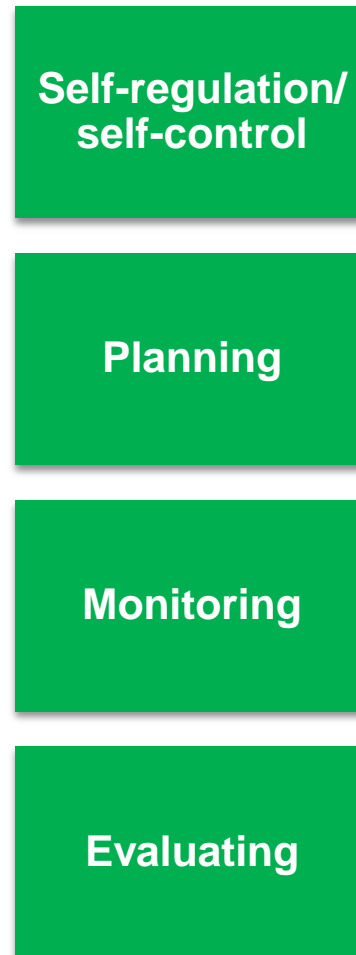
# Meta-competencies

reflecting on learning goals, strategies and results

## Metacognitive knowledge



## Metacognitive regulation



## Metacognitive reflection/ action

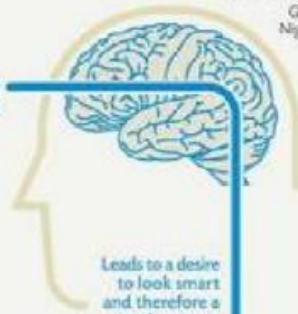


# TWO MINDSETS

CAROL S. DWECK, Ph.D.

Graphic by  
Nigel Holmes

**Fixed Mindset**  
Intelligence is static



Leads to a desire  
to look smart  
and therefore a  
tendency to...

**CHALLENGES**

...avoid  
challenges

**OBSTACLES**

...give up  
easily

**EFFORT**

...see effort as  
fruitless or worse

**CRITICISM**

...ignore useful  
negative feedback

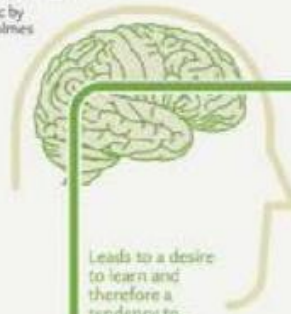
**SUCCESS OF OTHERS**

...feel threatened  
by the success  
of others

As a result, they may plateau early  
and achieve less than their full potential.

All this confirms a **deterministic view of the world.**

**Growth Mindset**  
Intelligence can be developed



Leads to a desire  
to learn and  
therefore a  
tendency to...

...embrace  
challenges

...persist in the  
face of setbacks

...see effort as  
the path to mastery

...learn from  
criticism

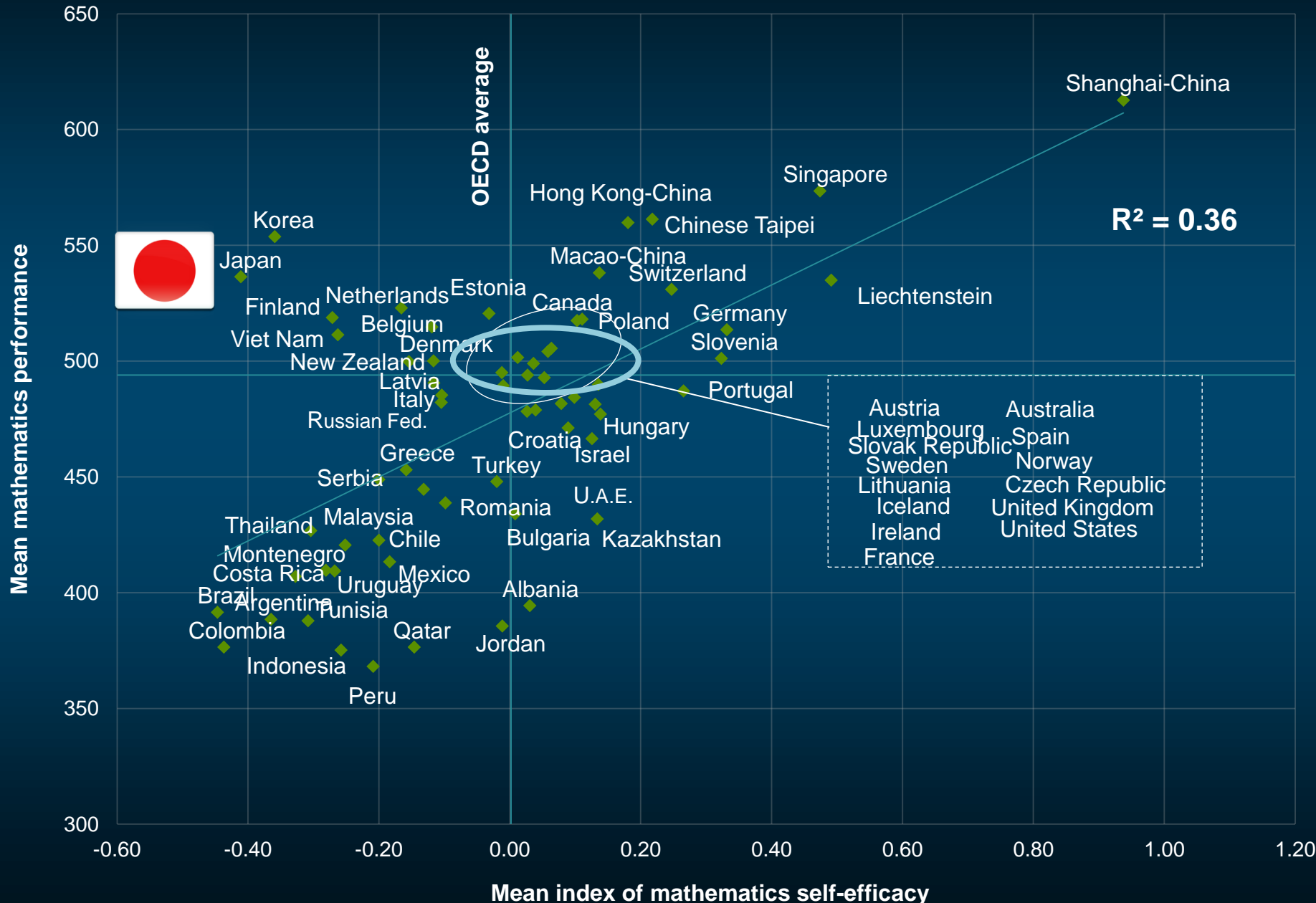
...find lessons and  
inspiration in the  
success of others

As a result, they reach ever-higher levels of achievement.

All this gives them a **greater sense of free will.**

# Countries where students have stronger beliefs in their abilities perform better in mathematics

Fig III.4.5



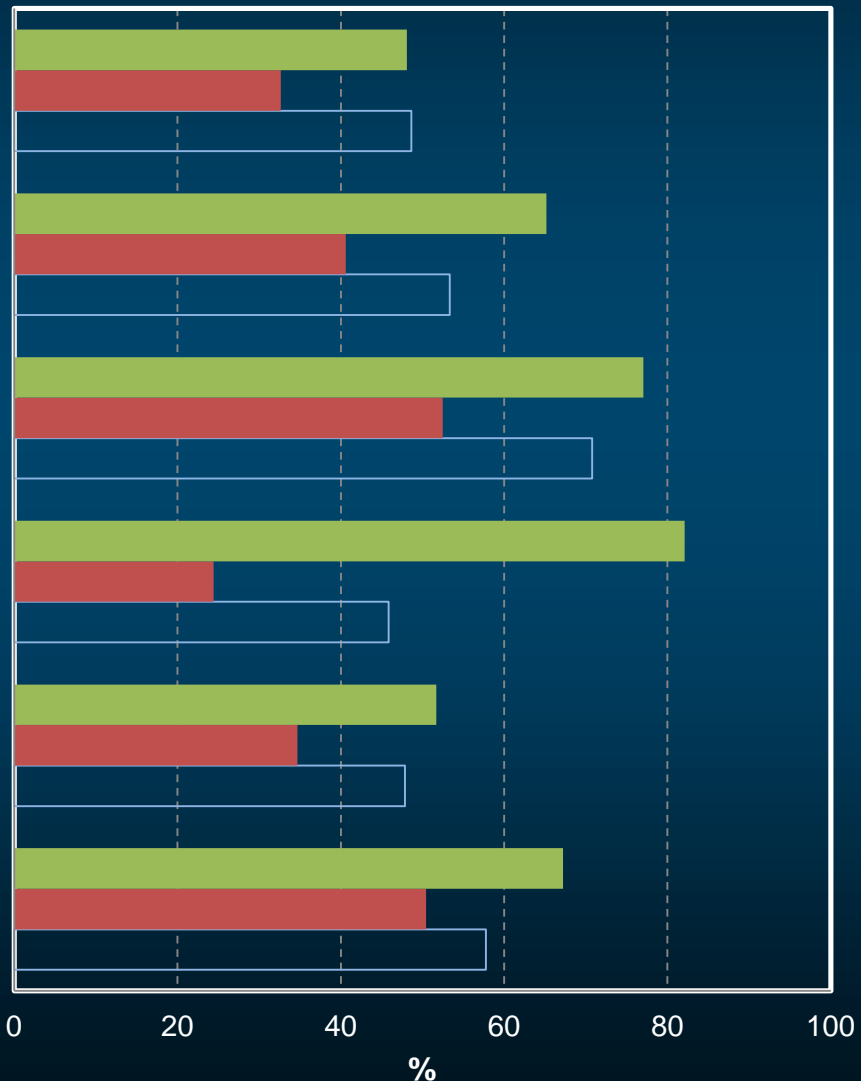
# Perceived self-responsibility for failure in mathematics

Fig III.3.6

Percentage of students who reported "agree" or "strongly agree" with the following statements:

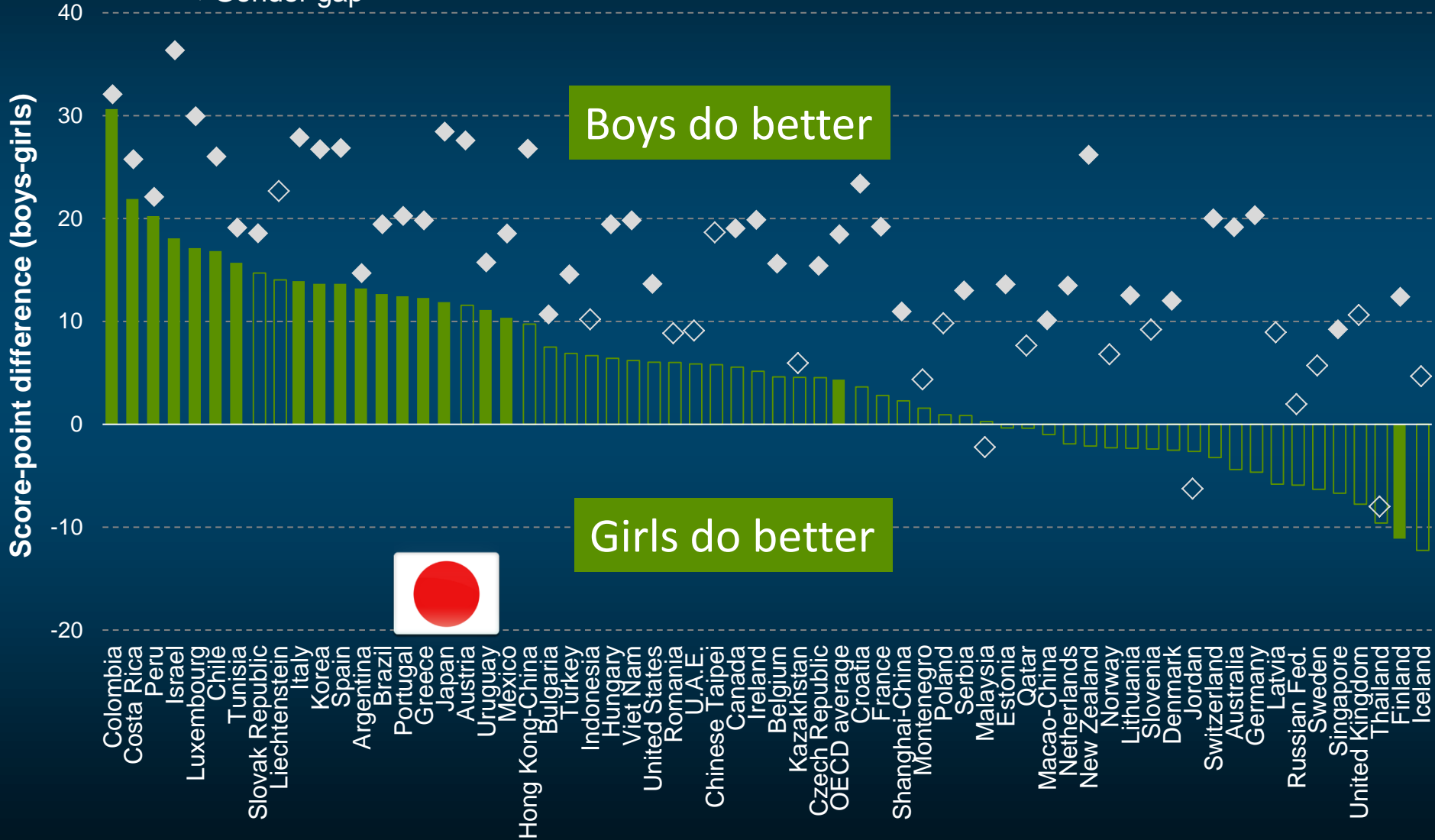
■ France ■ Shanghai-China □ OECD average

- Sometimes I am just unlucky**
- The teacher did not get students interested in the material**
- Sometimes the course material is too hard**
- This week I made bad guesses on the quiz**
- My teacher did not explain the concepts well this week**
- I'm not very good at solving mathematics problems**



Gender gap among the highest-achieving students (90th percentile)

- Gender gap adjusted for differences in mathematics self-efficacy between boys and girls
- ◆ Gender gap





**Making change happen**

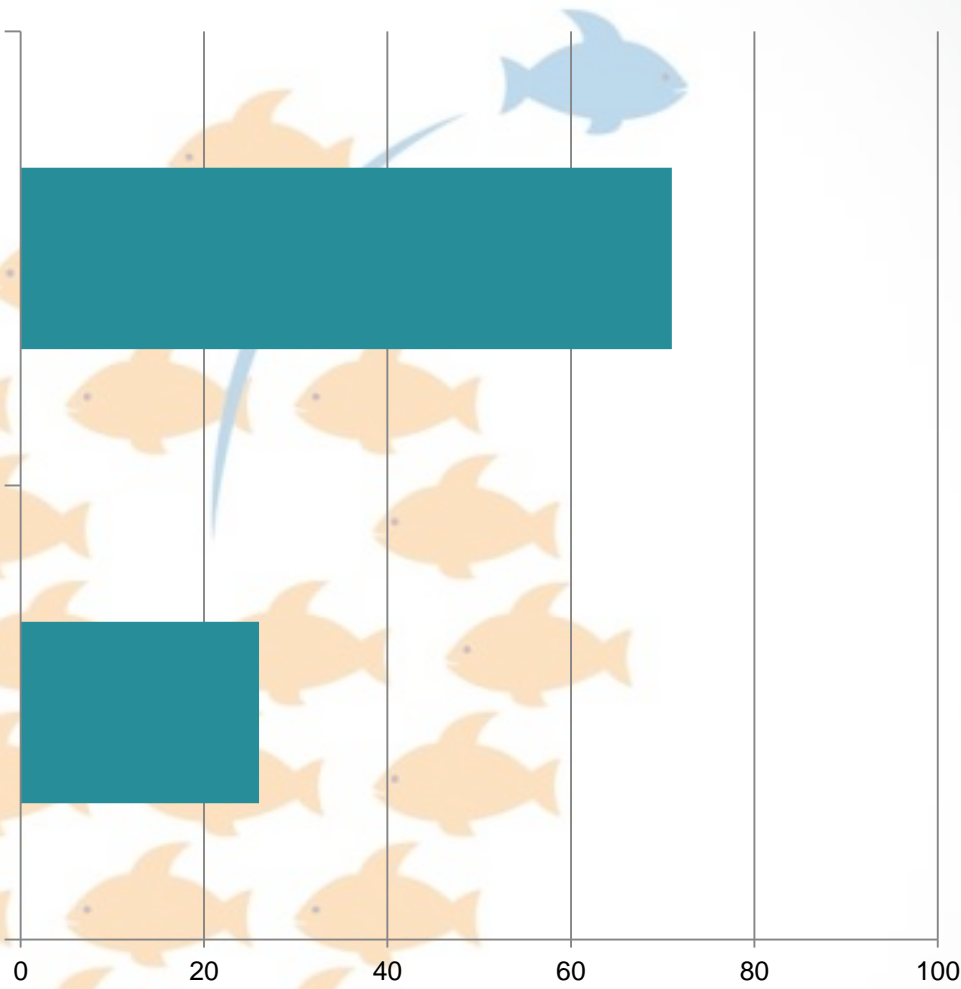
# What do teachers say about innovation?

Percentage of lower secondary teachers

Average

Innovative practices will be considered in appraisal with high or moderate importance

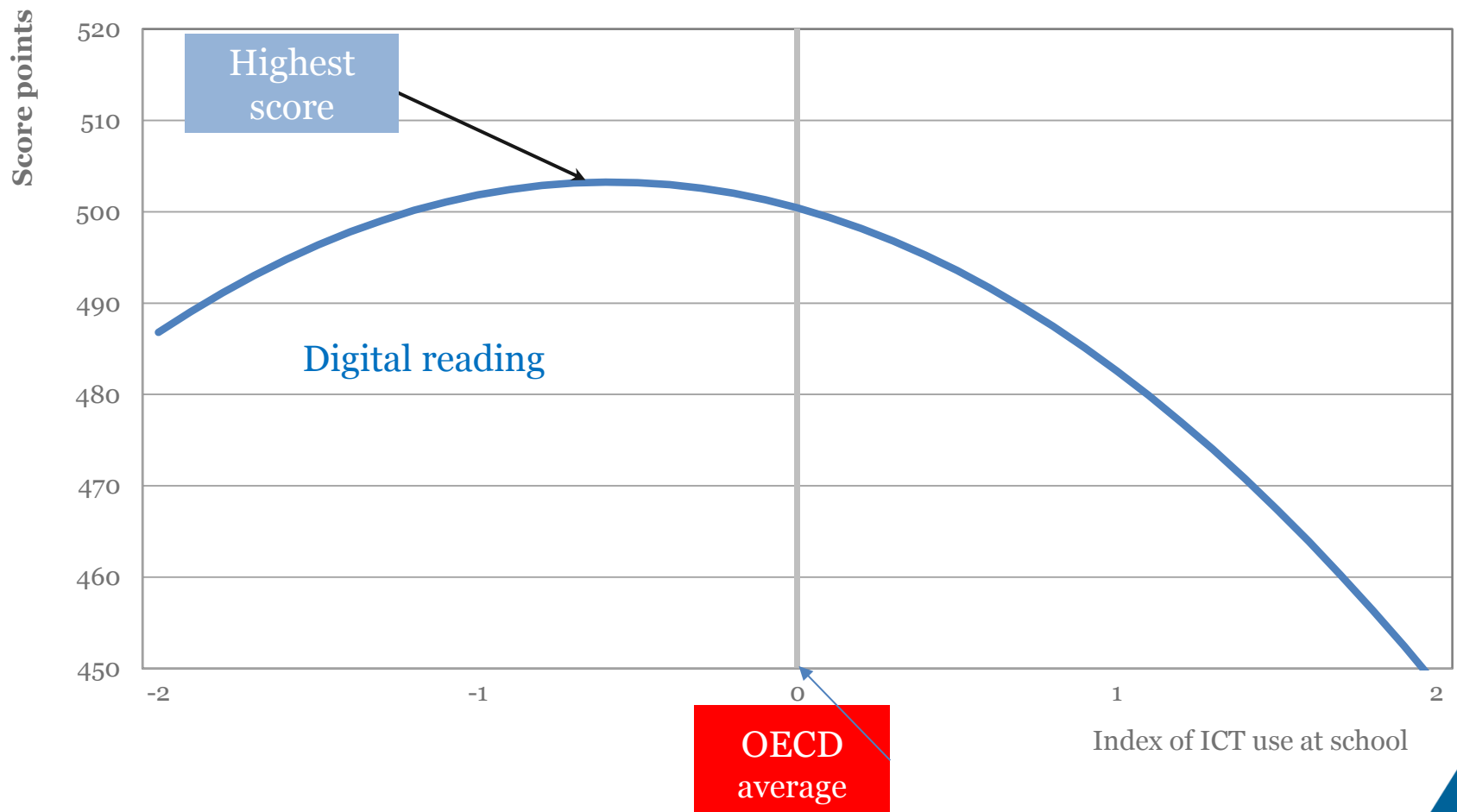
If I am more innovative in my teaching, I will be rewarded

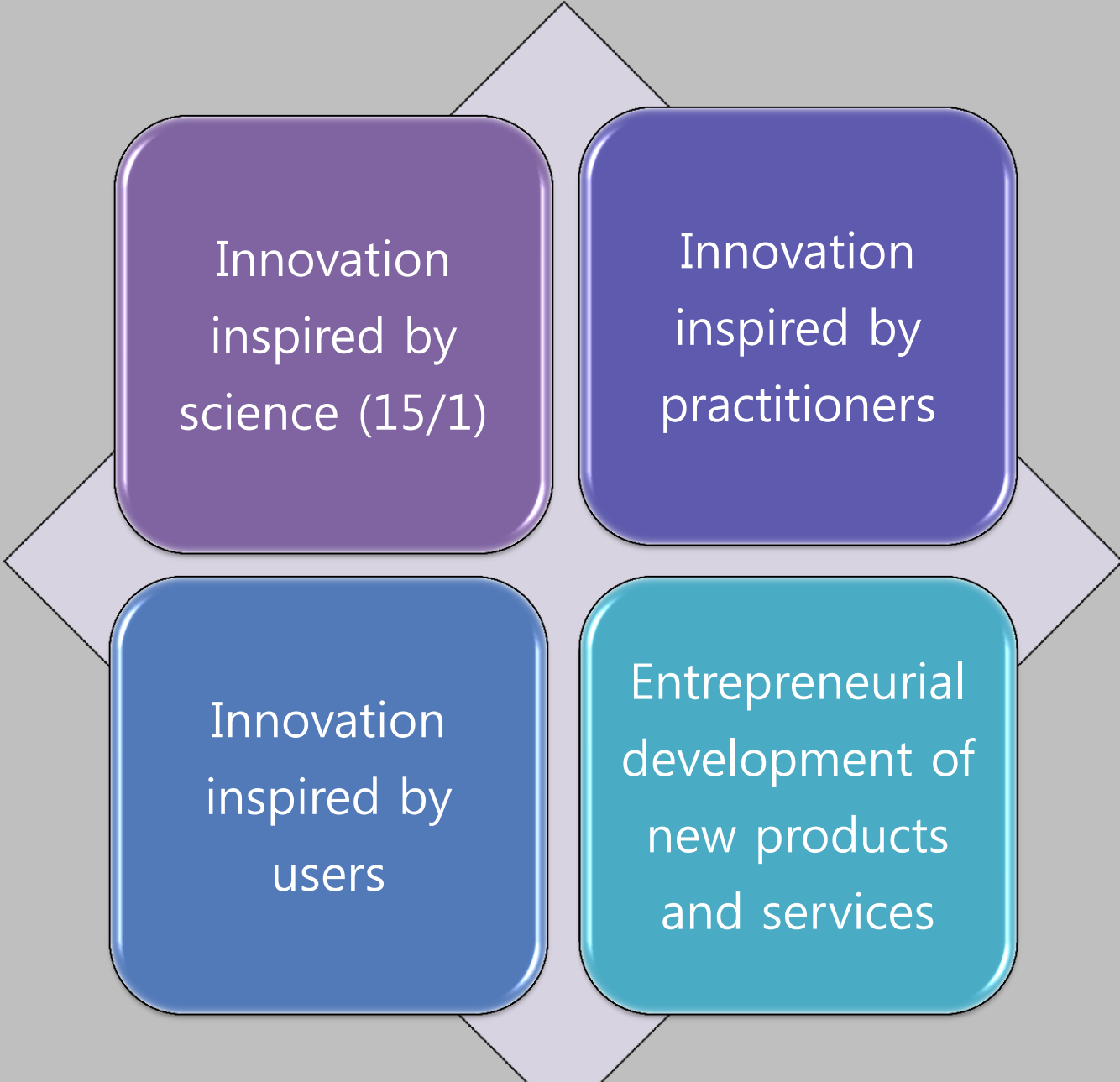




# Students who use computers at school only moderately score the highest in reading

Relationship between students' skills in reading and computer use at school (average across OECD countries)





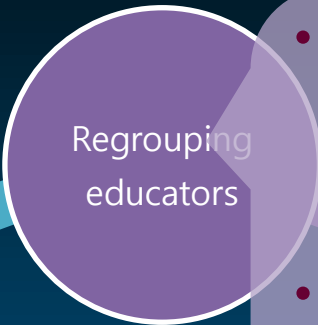
Innovation inspired by science (15/1)

Innovation inspired by practitioners

Innovation inspired by users

Entrepreneurial development of new products and services

# Making change happen



- To gain the benefits of collaborative planning, work, and shared professional development strategies
- To open up pedagogical options
- To give extra attention to groups of learners



- To allow for deeper learning
- To create flexibility for more individual choices
- To accelerate learning
- To use out-of-school learning in effective & innovative ways



- **Make costs and benefits of educational innovation as symmetric as possible**
  - **Everyone supports innovation**
    - (except for their own children)
  - **The benefits for ‘winners’ are often insufficient to mobilise support, the costs for ‘losers’ are concentrated**
    - That’s the power of interest groups
  - **Need for consistent, co-ordinated efforts to persuade those affected of the need for change and, in particular, to communicate the costs of inaction**

# Making change happen

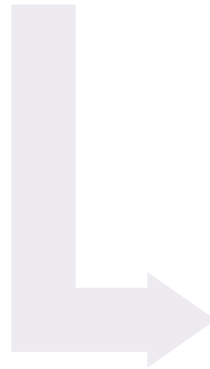
- **Given the uncertainties that accompany change, education stakeholders will always value the status quo.**
- **Successful innovations...**
  - are good at communicating the need for change and building support for change
  - tend to invest in capacity development and change-management skills
  - develop evidence and feed this back to institutions along with tools with which they can use the information
  - Are backed by sustainable financing
- **Teachers need to be active agents, not just in the implementation of innovations, but also in their design**

# OECD Education 2030

What competencies are needed by students in 2030?



Internationally validated OECD 21<sup>st</sup> century curriculum framework



Making change happen in education systems

Curriculum guideline and reform

Assessment framework

Policy dialogue

Etc etc

Average school systems

High performers in PISA

**Some** students learn  
at high levels



**All** students learn  
at high levels

Uniformity



Embracing diversity

Curriculum-centred



Learner-centred

Learning a place



Learning an activity

Prescription



Informed profession



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and remember:

Without data, you are just another person with an opinion