In-depth analysis of selected policies: education and skills

Anneleen Vandeplas and Anna Thum-Thysen
European Commission
Directorate General for Economic and Financial Affairs

Centre of Excellence in Finance Online Campus
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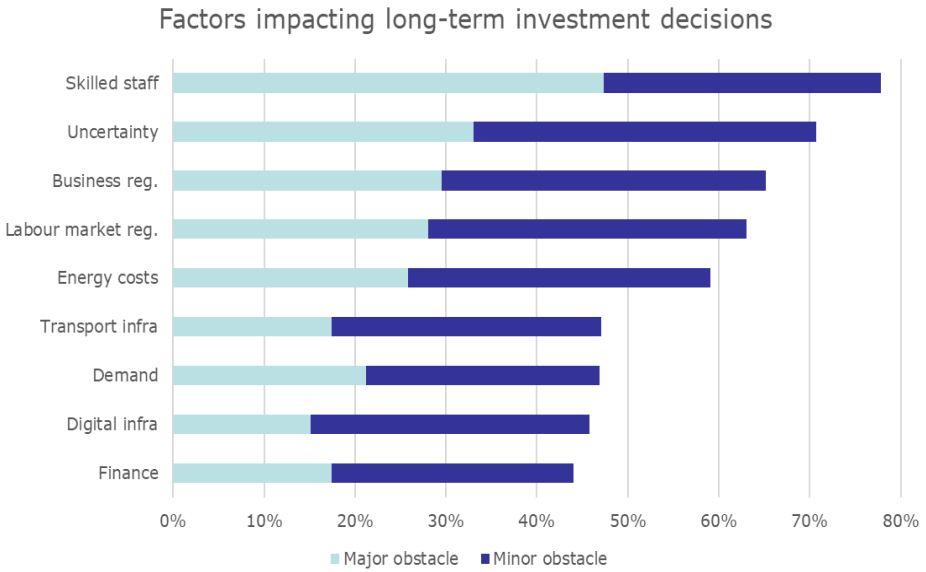
Education and training is one of the best investments a society can make

Education and training foster productivity:

- Skills facilitate **innovation**, **technology diffusion** and adaptation to technological change,… (see e.g. Andrews, Nicoletti, and Timiliotis 2018)
- Skills enhance **employability, resilience and allocative efficiency** (see e.g. Schultz 1975)

Availability of skills is the most often mentioned barrier to investment by firms



Source: EIB Investment Survey 2017
Notes: Long-term barriers to investment, Share of firms (%) that named it as an obstacle to their investment activities

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Education and training is one of the best investments a society can make

- But it does not come for free: *effectiveness and efficiency of investment in education* matter for sound public finance and productivity **(part 1 of the presentation)**
- *Matching skills demand and supply* crucial for productivity and resilience. **(part 2 of the presentation)**

Policy implications: how to improve efficiency and skill matching?

=> Relevance/use for policy: all our analysis went into a Note for "Jumbo Council" meeting ECOFIN and EYCS in November 2019 (Paper to be published soon on EC website)

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1. EFFICIENCY ANALYSIS:

CALCULATING HOW WELL INPUTS ARE TRANSFORMED INTO OUTPUTS

Anna Thum-Thysen

Effectiveness and efficiency of investment in education and training matter

- Achieving good educational outcomes requires appropriate spending:
  ⇒ Spend money *effectively* to reach high quality and equitable outcomes
  ⇒ Make *efficient* use of the resources available

- Public spending in the EU has become more efficient over time in achieving high educational attainment, but not more efficient in terms of PISA scores

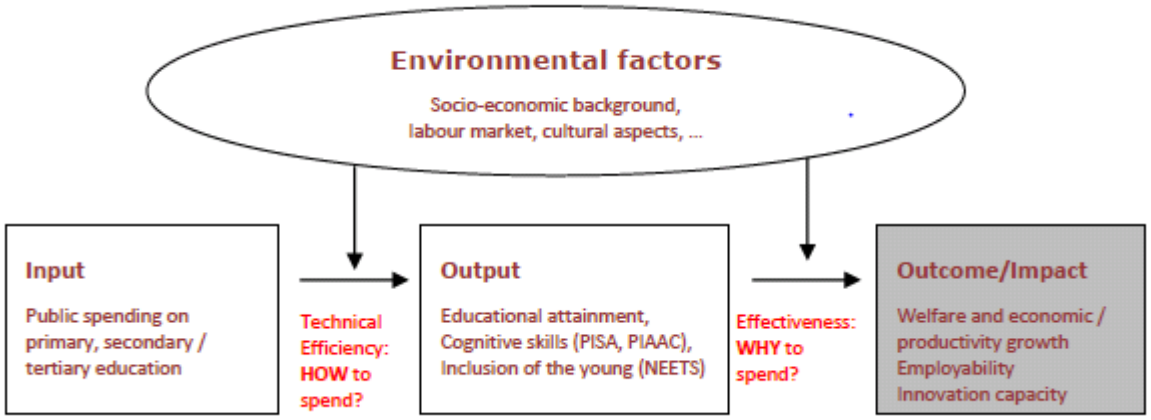
- Some member states are more efficient in reaching high PISA scores, others in reaching high educational attainment or in inclusiveness, some show that it is possible to strike a favourable balance between output dimensions

- Raising efficiency of public spending on education boosts growth: simulations show that member states can gain between 0.4 and 1.6 %-points by reducing inefficiencies

Efficiency and effectiveness – starting with some definitions

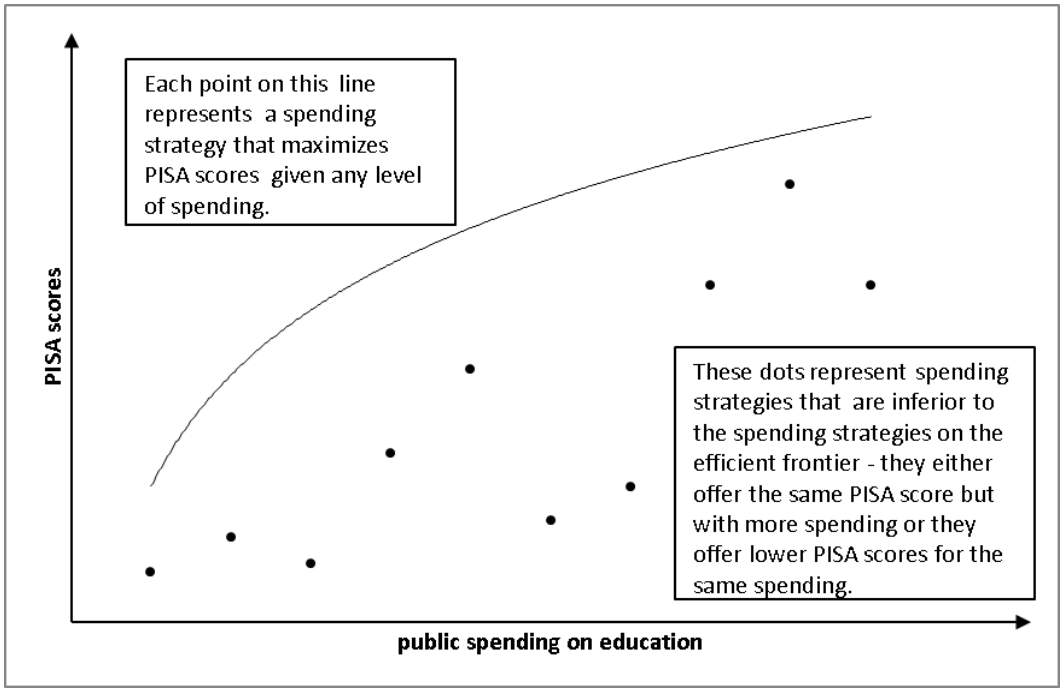
- **Efficiency:** *Efficiency* measures how successfully inputs are transformed into outputs. ("doing things right")
- **Effectiveness:** *Effectiveness* measures how successfully a system achieves a set of desired outputs. ("doing the right thing")

=> Both efficiency and effectiveness can boost GDP per capita growth.



Efficiency analysis for the Eurogroup (2017)

- **Efficiency:** measures how successfully inputs are transformed into outputs ("doing things right")
- Measuring efficiency: compare observed output with maximal possible output given technology and inputs (best performer)
- Efficiency scores measure the distance to the best performer



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Efficiency analysis for the Eurogroup (2017)

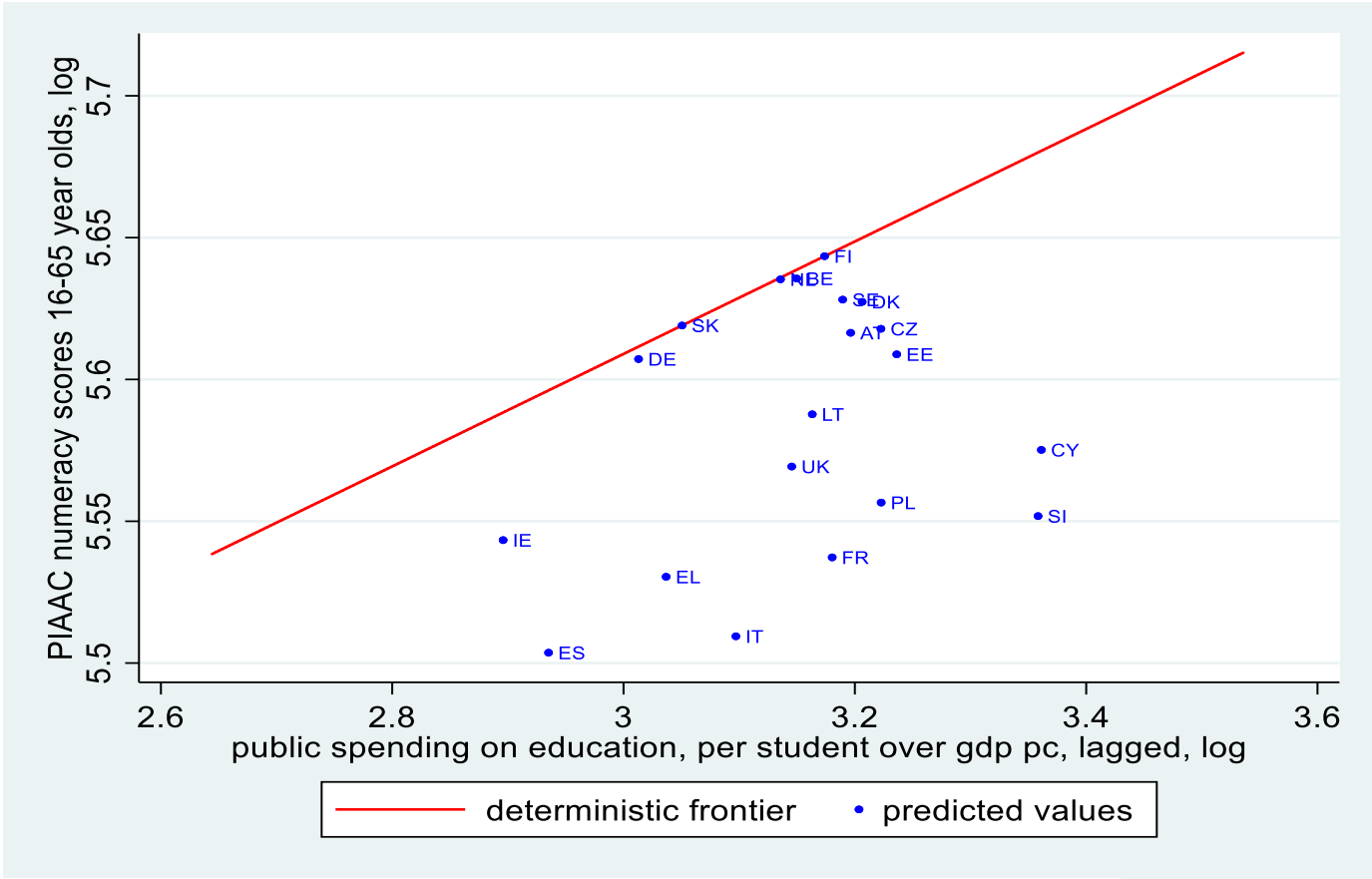
- We estimate maximum possible output and efficiency scores ('efficiency analysis'). The ingredients of our efficiency analysis are:

  - **Input:** public spending on education (compulsory schooling or total spending)
  - **Outputs:** tertiary educational attainment (quantity), PISA scores or PIAAC scores (quality), rates of young people not in employment, education or training (NEET) or early school leavers (inclusion)
  - **Other factors:** parental education, GDP growth rate
  - **Method:** 'Stochastic Frontier Analysis'

How efficient is public spending on education *across* EU member states?

Need for spending money *effectively* to reach high quality and equitable outcome and making *efficient* use of the resources available.

Efficiency of public spending and PIAAC scores



Source: E. Canton, A. Thum-Thysen and P. Voigt (2017), DG ECFIN Discussion Paper No. 081, https://ec.europa.eu/info/sites/info/files/economy-finance/dp081_human_capital.pdf;

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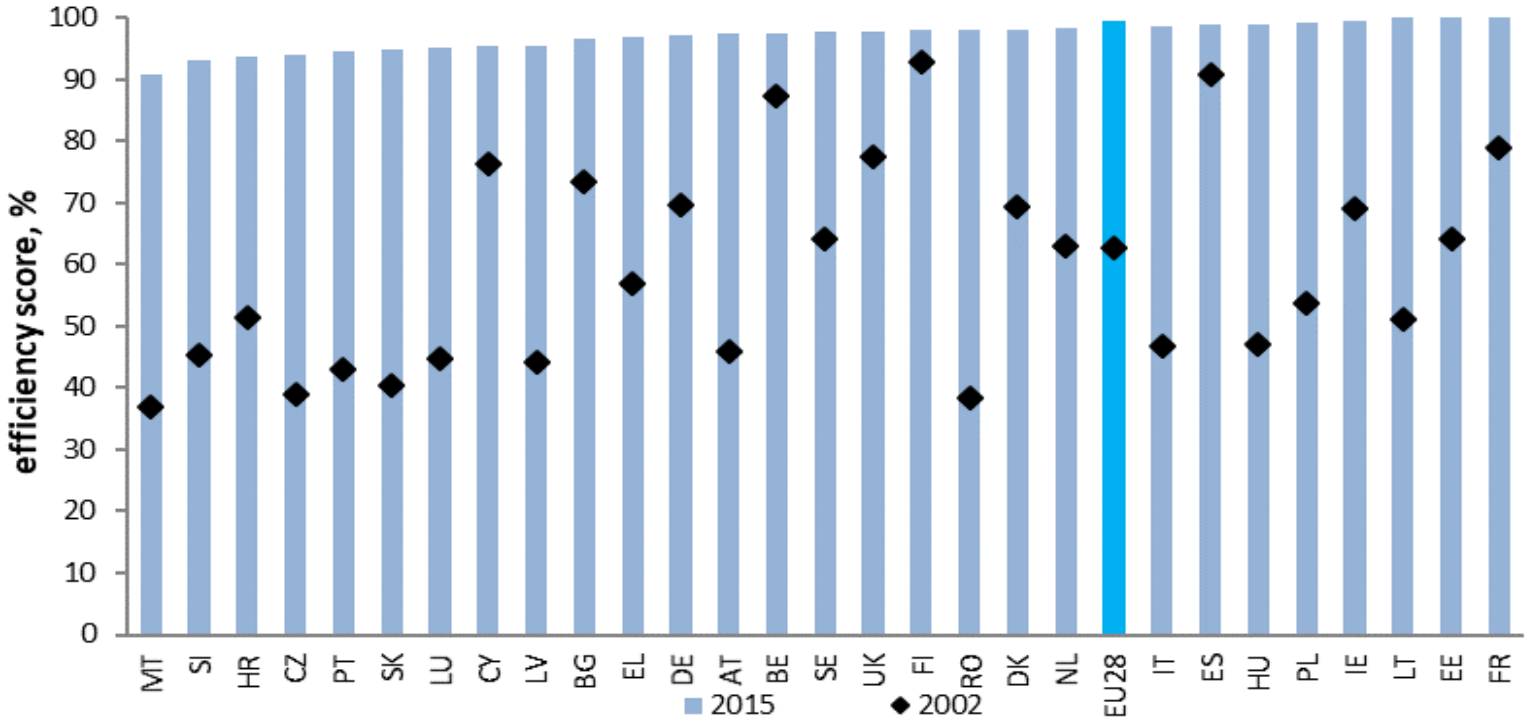
How efficient is public spending on education *in* EU member states?

Efficiency scores for public spending on education, assessing performance over time,

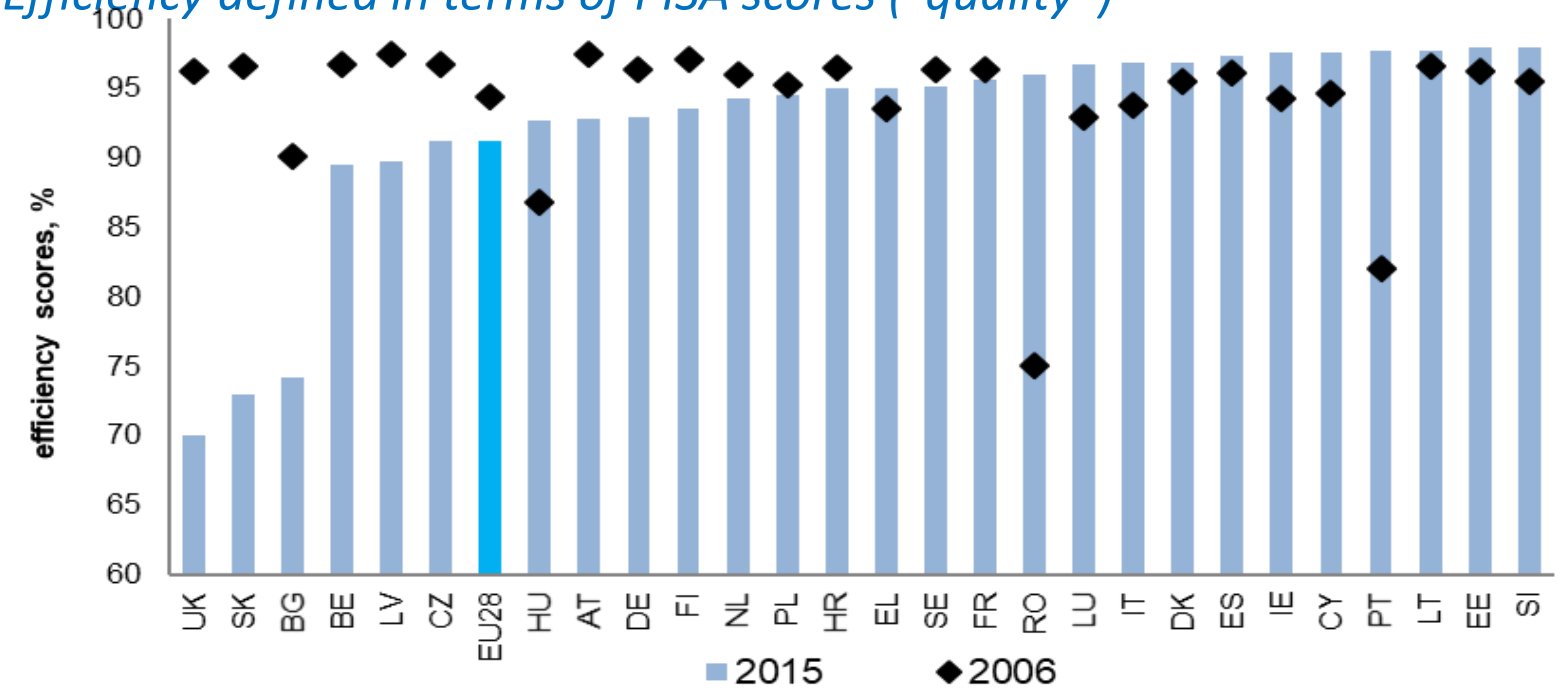
Efficiency defined in terms of tertiary educational attainment ("quantity")



Source: own calculations based on Eurostat COFOG and LFS data; presented to EPC and the Eurogroup in 2017; Source: E. Canton, A. Thum-Thysen and P. Voigt (2017), DG ECFIN Discussion Paper No. 081, https://ec.europa.eu/info/sites/info/files/economy-finance/dp081_human_capital.pdf

How efficient is public spending on education *in* EU member states?

Efficiency scores for public spending on education, assessing performance over time,
Efficiency defined in terms of PISA scores ("quality")



Source: own calculations based on OECD PISA and Eurostat COFOG and LFS data; presented to EPC and the Eurogroup in 2017; PISA science scores are not available for Malta; Source: E. Canton, A. Thum-Thysen and P. Voigt (2017), DG ECFIN Discussion Paper No. 081,
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Potential gains in GDP/capita growth due to increasing efficiency for ECOFIN (2019)

- **Step 1 calculate E^*:** educational output (E) that can be achieved by maximising efficiency (eff) of public spending on education: see previous slides
- **Step 2 calculate the gain in GDP per capita growth (ΔY):** from increasing the educational output to its efficiency- maximising level

$$\Delta Y = \beta \Delta E^*$$

β: increase in 100 points of PISA scores is associated with a 1.2 %-point increase in annual GDP/cap growth. (Balart et al 2018; Hanushek and Woessmann 2012) => (corresponding value for 1 sd change; diff Mexico and OECD average in 2015)

Example Estonia:

Step 1: $PISA(E) = 534;\ E^* = 565;\ (E - E^*) = 30$; divide by sd: $\Delta E^* \approx 30/100$

Step 2: $\Delta Y = \beta \Delta E^* \Leftrightarrow 0.4 \approx 1.2 * 0.3$ (dark blue bar)

Result: GDP/capita growth in EE would increase from 2.6% to 3.0%

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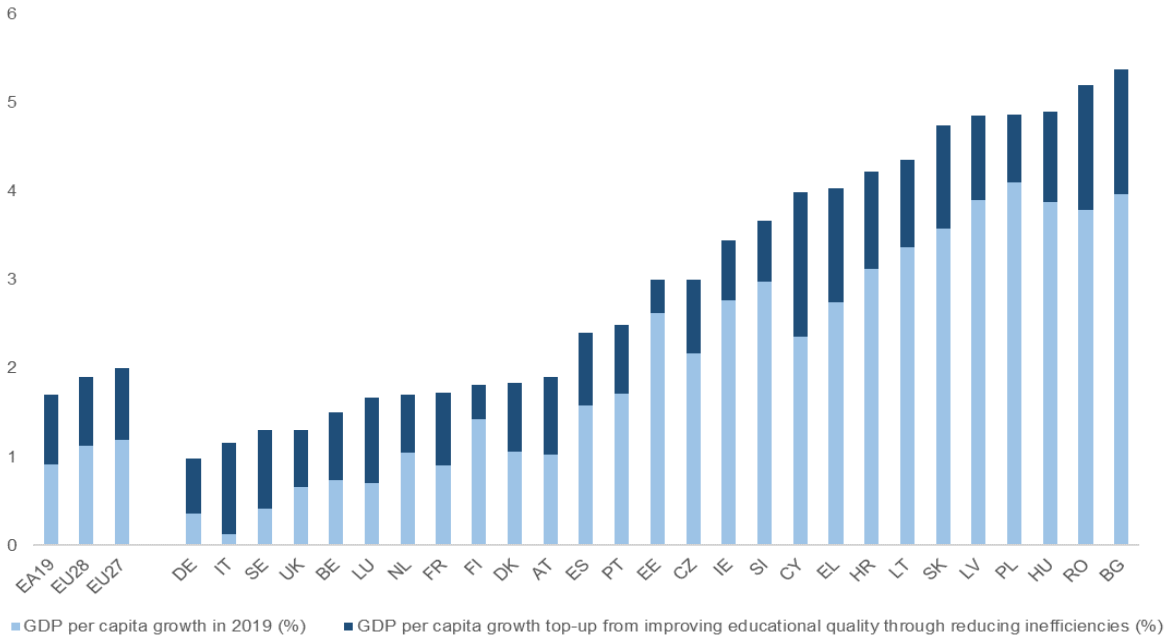
Raising efficiency of public spending on education boosts growth

Using current expenditures on schooling in the most efficient way in terms of achieving high PISA science scores could lead to improvements in annual GDP/capita growth of 0.4 (EE) -1.6 p.p (CY); 0.8 in the EU in the long run.



Source: own calculations based on OECD PISA and Eurostat COFOG and LFS data and parameter estimates by Balart et al. (2018); PISA science scores for Malta are not available

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Gradual phasing in of the reform effect

- Hanushek and Woessmann (2019) assume following dynamics with education=15 years; working life=40 years; expected life time=80 years:
  - It takes 40 years for those that just left education when the reform was implemented (i.e. did not benefit at all from reform) to all finish their working life.
  - So after 40 years, the workface consists fully of employees that have benefitted for at least one year from the educational reform.
  - It takes 15 more years for those that only benefitted partially to all finish their working life.
  - So after 55 years, the workforce consists fully of people that benefitted for the full 15 years of reformed education and the economy grows at the new rate (full reform effect)

Gradual phasing in of the reform effect

- Calculate growth effect with and without reform:

a) Without reform, the economy grows at the constant growth rate of potential GDP:

$$(C5) \qquad GDP^{t}_{no\ reform} = GDP^{t-1}_{no\ reform} * (1 + potential\ growth)$$

b) With reform, the annual growth rate is additionally increased by the growth effect Δ^t:

$$(C6) \qquad GDP^{t}_{reform} = GDP^{t-1}_{reform} * (1 + potential\ growth + \Delta^t)$$

- Calculate vale of total reform:

Total effect of the reform:

The total value of the reform is given by the sum of the discounted values of the annual differences between the GDP with reform and the GDP without reform:

$$(C7) \qquad Total\ value\ of\ the\ reform = \sum_{t=2010}^{t=2090} \left(GDP^{t}_{reform} - GDP^{t}_{no\ reform}\right) * (1 + discount\ rate)^{-(t-2010)}$$

=> We find increase of GDP 50% higher compared to non-reform after 80 years

Limitations of the analysis

- Results demonstrate large ***potential*** gains from efforts to increase the efficiency of spending on education.
- But they should be interpreted in a prudent way.
- They rely on **simplifying hypotheses:**
  - full removal of all *inefficiencies*
  - *multipliers* taken from the literature: 'social return' estimate taken from Balart et al. (2018) and Hanushek and Woessmann (2015) refer to a large increase in PISA. For example, if the PISA score mean was 500, a 13% increase would imply an increase by 65 points.
  - *Relationship inefficiencies and educational output*: reduction of inefficiencies affects educational output linearly
  - *Static* exercise (no feedback loops)

Overall results of efficiency analysis:

- Our efficiency analysis further shows that:
  - Public spending in the EU has become ***more efficient over time in achieving high educational attainment (number of tertiary graduates), but not in terms of PISA scores***
  - Some member states are more efficient in reaching high PISA or PIAAC scores, others in reaching high educational attainment or in inclusiveness, some show that ***it is possible to strike a favourable balance between output dimensions***
  - Raising efficiency of public spending on education boosts growth: simulations show that ***member states can gain between 0.4 and 1.6 %-points in GDP per capita growth by reducing inefficiencies***

2. MEASURING AND ANALYSING SKILLS MISMATCH IN THE LABOUR MARKET

[SEE SEPARATE SLIDES]

Anneleen Vandeplas