CROATIAN NATIONAL BANK

Human capital and economic growth in Croatia: How to make the ship move faster?

8th International conference:
'An Enterprise Odyseey: Saving the Sinking Ship Through Human Capital'

Faculty of Economics & Business, Univ. of Zagreb, June 8, 2016

Boris Vujčić, Governor
e-mail: boris.vujcic@hnb.hr

Outline

- Human capital - definition and measurement
- Microeconomic and macroeconomic approach to human capital
- Quality vs. quantity
- Human capital in Croatia
- Labour market institutions
- Conclusion

"The most valuable of all capital is that invested in human beings."

Alfred Marshall, Principles of Economics

Human capital – a broad concept

- Aggregation of attributes that determine how productive people are in their workplaces and in society in general;
- Often referred to formal and informal education and health;
- Broader definitions include also ones' innate abilities and personality characteristics;
- Frank and Bernanke (2007) define human capital as „composite of factors such as education, experience, training, intelligence, energy, work habits, trustworthiness and initiative that affect the value of a worker's marginal product”

Driver of individual income, productivity and economic growth

- Broad consensus in economic theory supported by a variety of empirical studies on a positive role that human capital plays in driving workforces‘ income, productivity and countries' economic growth
- Two type of studies:
  - Microeconomic approach: assesses return of investment in human capital for the individual
  - Macroeconomic approach: assesses the impact of human capital on overall economic growth

Measurement of human capital

- Indicators of education such as enrolment rates and/or educational attainment level commonly used as proxy for human capital
  - main mechanism of increasing human capital
  - quantifiable and relatively easy available for longer time periods;
- These indicators do not take into account the education outcomes in terms of developed cognitive skills (i.e. quality of schooling);
- More recently, studies have tried to take into account quality of schooling by using data such as scores in standardized international achievement tests (e.g. PISA, IALS);

Microeconomic approach

- Draws heavily on the writings of Becker (1962, 1964), Schultz (1961, 1962) and Mincer (1958, 1962, 1974);
- It has been shown that higher human capital is related to ones' more favourable labour market outcomes – higher earnings, higher participation and employment rate;
- Large body of literature focused on assessing private return to investment in education;
- Private rates of return provide a guideline for individuals as to whether to continue or stop schooling;

Individual return to education – empirical results

- Studies for EU countries indicate that each additional year of education is on average associated with a private return of more than 8%;
- Rates of return to tertiary education in emerging markets are higher than in developed EU countries (OECD, 2008);
- For Croatia, Nestić (2005) showed that wages of college graduates are 6.5% higher compared to lower level of education
- Vujčić and Šošić (2007) showed that additional year of schooling results in 6%-8% higher wage

Estimate of private returns to schooling, in percent

	Harmon et al. (2001)	de la Fuente (2003)	de la Fuente and Jimeno (2004)	OECD (2008) - only tertiary education	Nestić (2005) - college graduate (rel. to the 2-year college)	Vujćić and Šošić (2007)
BE	:	8.6	7.5	12.7	:	:
DK	5.7	8.9	8.0	4.3	:	:
DE	8.7	10.4	9.1	6.4	:	:
IE	10.9	10.4	11.0	11	:	:
GR	8.2	9.8	9.2	:	:	:
ES	8.2	9.4	7.5	8.2	:	:
FR	7.8	9.6	8.6	7.9	:	:
IT	7.9	8.6	8.4	:	:	:
NL	7	8.0	6.6	:	:	:
AT	8.6	10.5	8.5	:	:	:
PT	9.7	12.3	10.3	22.7	:	:
FI	8.7	9.6	10.0	10	:	:
SE	4	6.1	4.3	4.7	:	:
UK	10.3	13.9	12.3	14.4	:	:
CZ	:	:	:	26.5	:	:
HU	:	:	:	16.8	:	:
PL	:	:	:	20.7	:	:
HR	:	:	:	:	6.5	6.2 (men)/ 7.8 (women)

Sources: Commission compilation, OECD (2008)

Macroeconomic approach

- In neo-classical growth model from the 1950s (Solow (1956; 1957)) no special attention was given to human capital
- Work of Romer (1986, 1990) and Lucas (1988) and the emergence of a new endogenous growth literature provided a framework for incorporating human capital as an engine of growth
- Empirical testing based on augmented Cobb-Douglas production function or growth regressions which include set of variables assessed to be relevant for testing productivity effects of human capital (for a detailed survey of literature see Sianesi and Van Reenen (2000), Wilson and Briscoe (2004) and de la Fuente and Ciccone (2003))

Augmented production function

- Human capital can be incorporated in standard production function in two ways:
  - as an additional input

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} H_t^{\delta}$$

  - where Y_t is GDP in real terms, A_t is total factor productivity, K_t is capital stock, L_t is total employment and H_t is stock of human capital
  - or as a determinant of the rate of technological progress where general specification used in studies takes the form

$$a_t = \gamma_0 + \alpha b_t + \beta H_t + \delta H_t b_t + \varepsilon RD_t$$

  - where a_t is growth rate of TFP, b_t proxy for the technological gap between country and the world best practice frontier, and RD_t a measure of R&D expenditure

Human capital effects on growth - empirical results

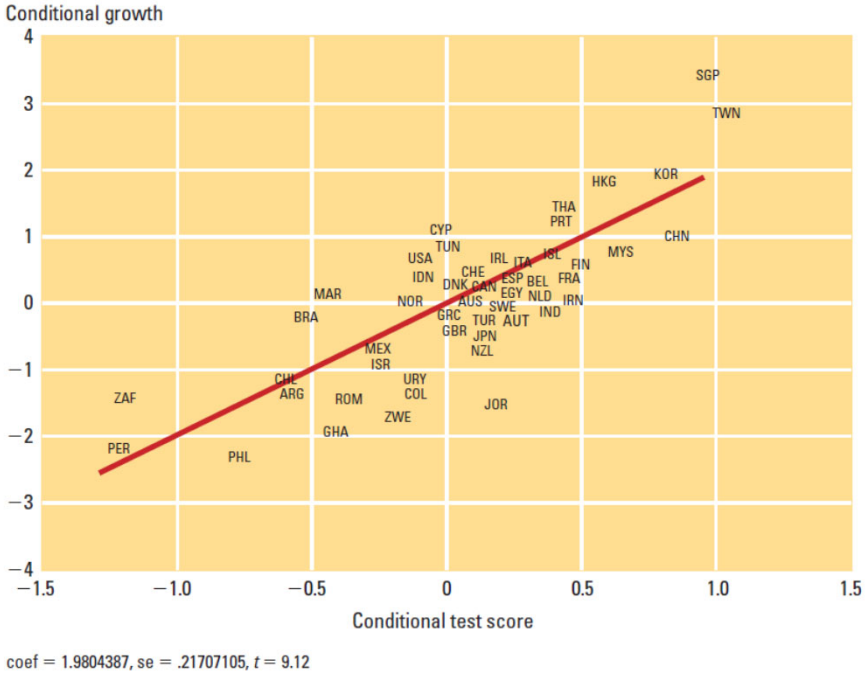
- Growth regressions suggest that an overall 1 % increase in school enrolment rates could lead to an increase in GDP per capita growth of between 1 and 3 % (Barro, 1991).
- Moreover, an additional year of secondary education which increases the stock of human capital, rather than just the flow into education, could lead to more than a 1 % increase in economic growth each year (Barro, 1997).
- The impact of increases in various levels of education vary according to the level of a country's development (Vandenbusche, Aghion, and Meghir, 2006).
- Primary and secondary skills related to growth in the poorest and in intermediate developing countries. Tertiary skills more important for growth in developed countries (Gemmell, 1996).

Quality of education – years of schooling vs. quality of education

- Schooling quality more important than quantity (Lee and Lee (1995), Judson (1998), Hanuskhek and Kimko (2000), Hanushek and Woesman (2008)).
- Dessus (1999) argues that the impact on productivity of an additional year of schooling should vary across countries depending on the quality of the education system.
- Variations in skills measured by international math and science tests are strongly related to variations in economic growth (Hanushek and Woessmann, 2011).
- Relatively small improvements in the cognitive skills of a nation's labor force can have very large effects on long-run economic well-being (Hanushek and Woessmann (2010a)).

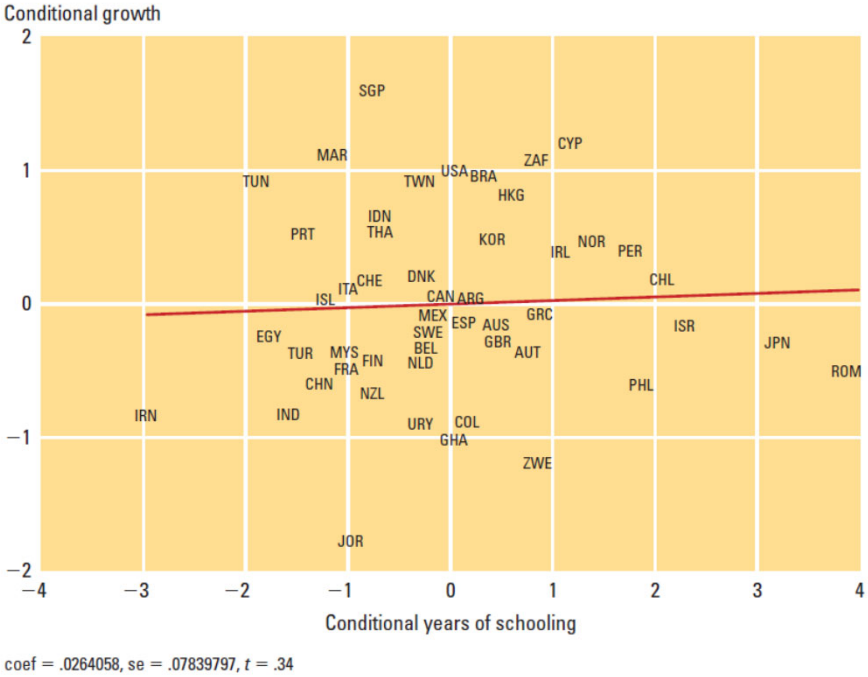
Quality of education – years of schooling vs. quality of education

Quality



coef = 1.9804387, se = .21707105, *t* = 9.12

„Quantity"

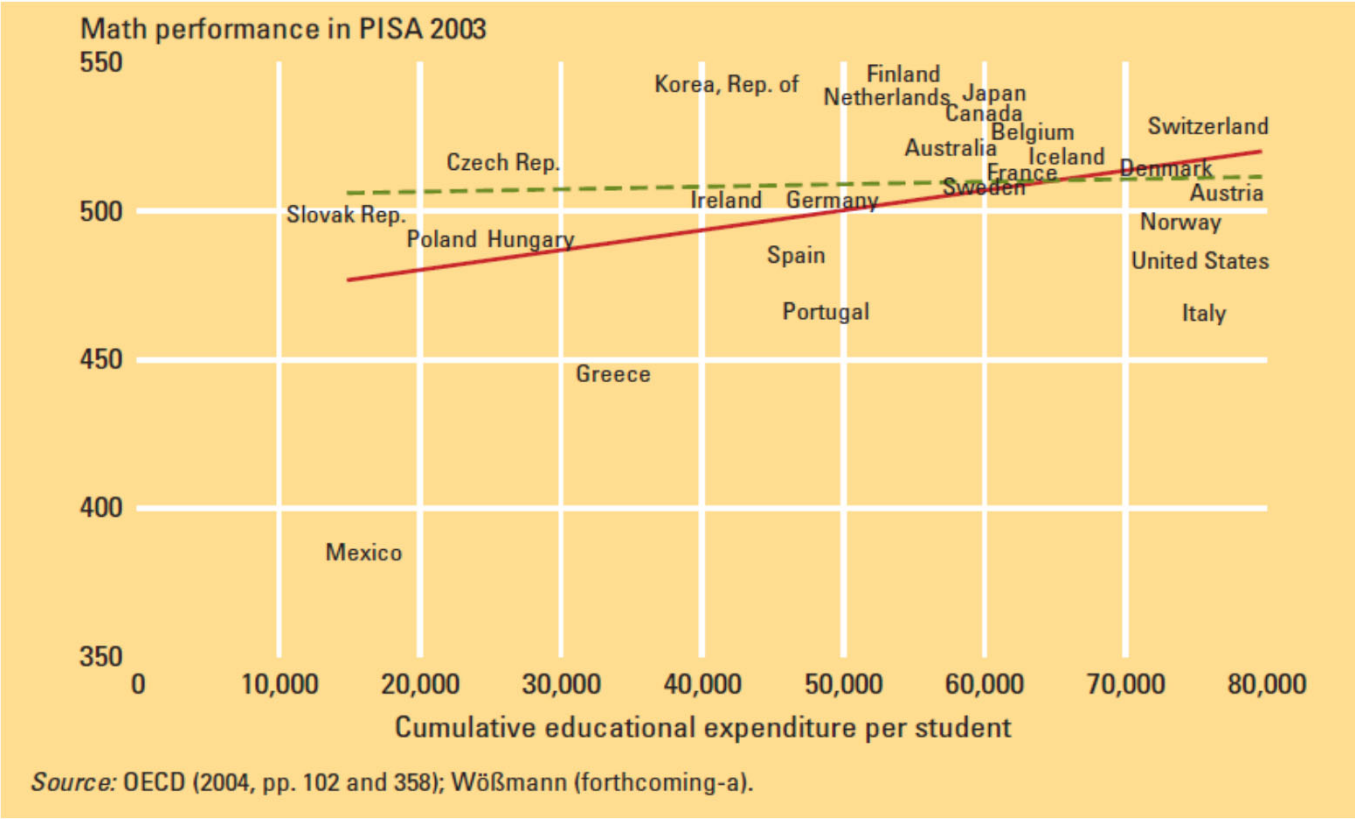


coef = .0264058, se = .07839797, *t* = .34

Note: Both growth and education are expressed conditional on the other variables in the model, i.e. these are partial regression plots of a regression of the average annual rate of growth (in percent) of real GDP per capita in 1960–2000 on the initial level of real GDP per capita in 1960, average test scores on international student achievement tests, and average years of schooling in 1960.

Source: Education Quality and Economic Growth, World Bank, 2007 (taken over from Hanushek and Woessman, 2007)

Quality of education – can it be purchased?



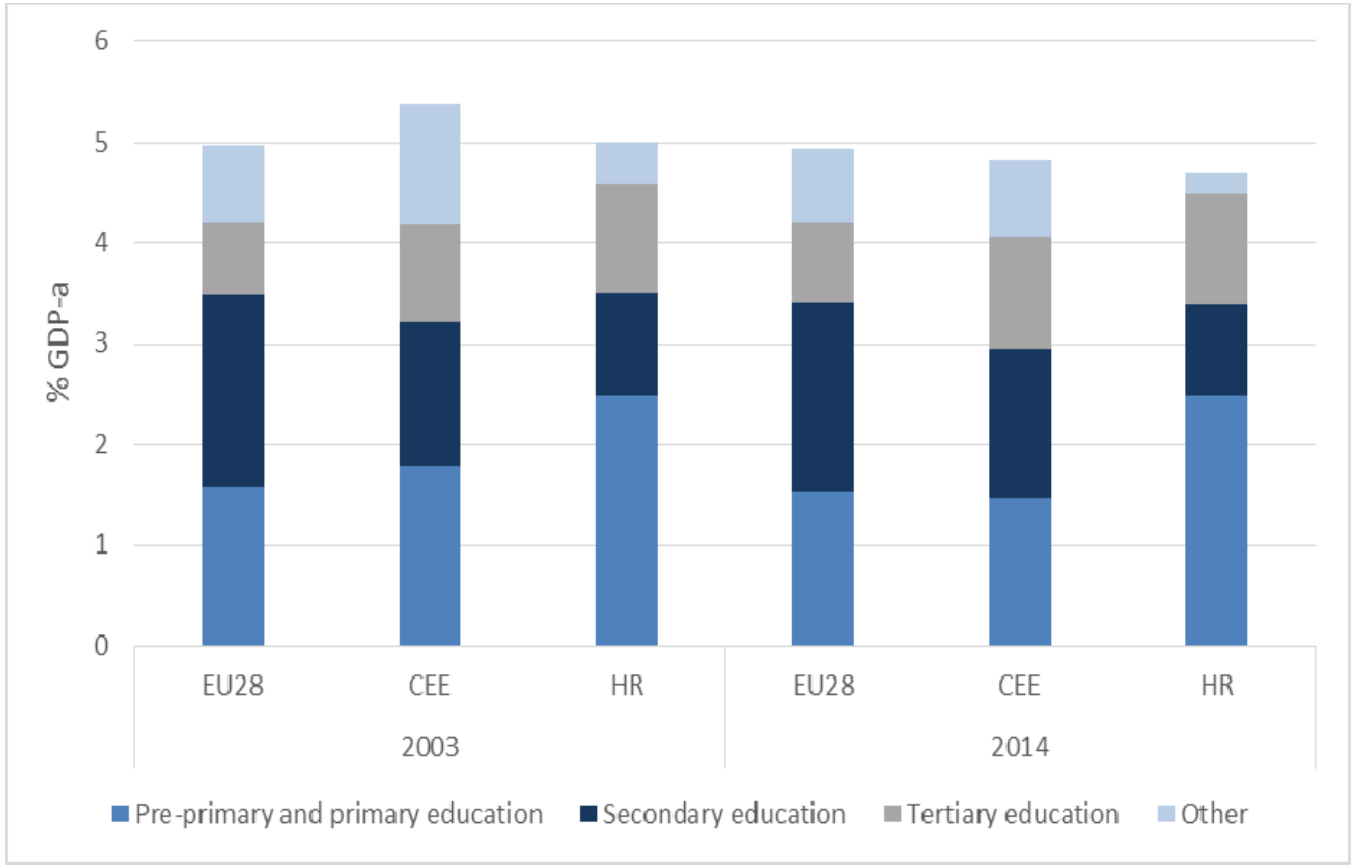
Note:The solid line is the regression line for PISA scores on cumulative expenditure (age 6–15). This relationship is almost entirely due to the two spending and performance outliers—Mexico and Greece. Omitting Mexico and Greece, there is no relationship between expenditure and performance (the dashed regression line).
Source: Education Quality and Economic Growth, World Bank 2007

Human capital in Croatia – where do we stand compared to other European countries?

Quantity – not much different

Government spending on education close to EU average but composition differs

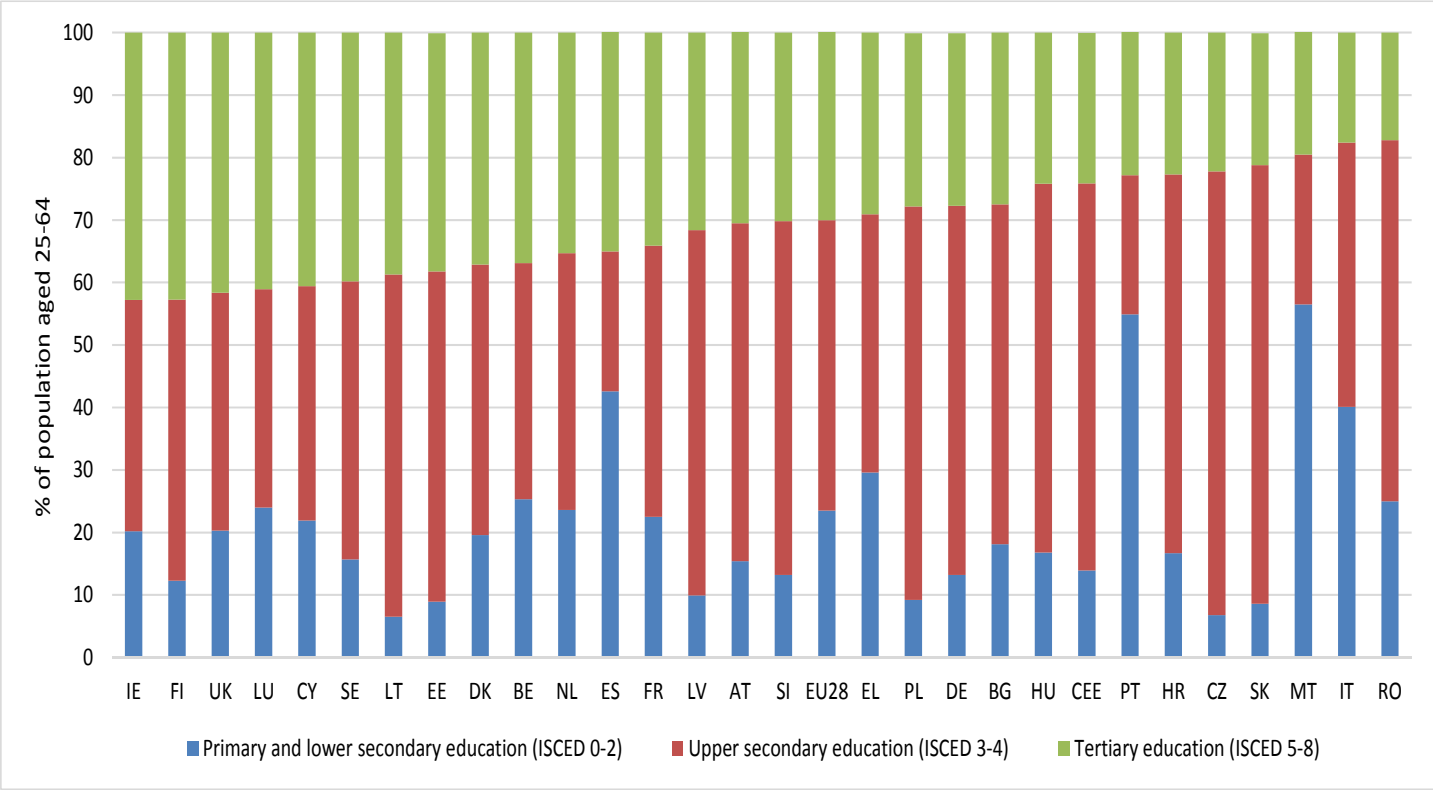
Total government expenditure on education by level of education, 2003 and 2014 (% of GDP)



Source: Eurostat

Similar composition of working age population by education level in Croatia with the CEE countries, but less favourable compared to the EU

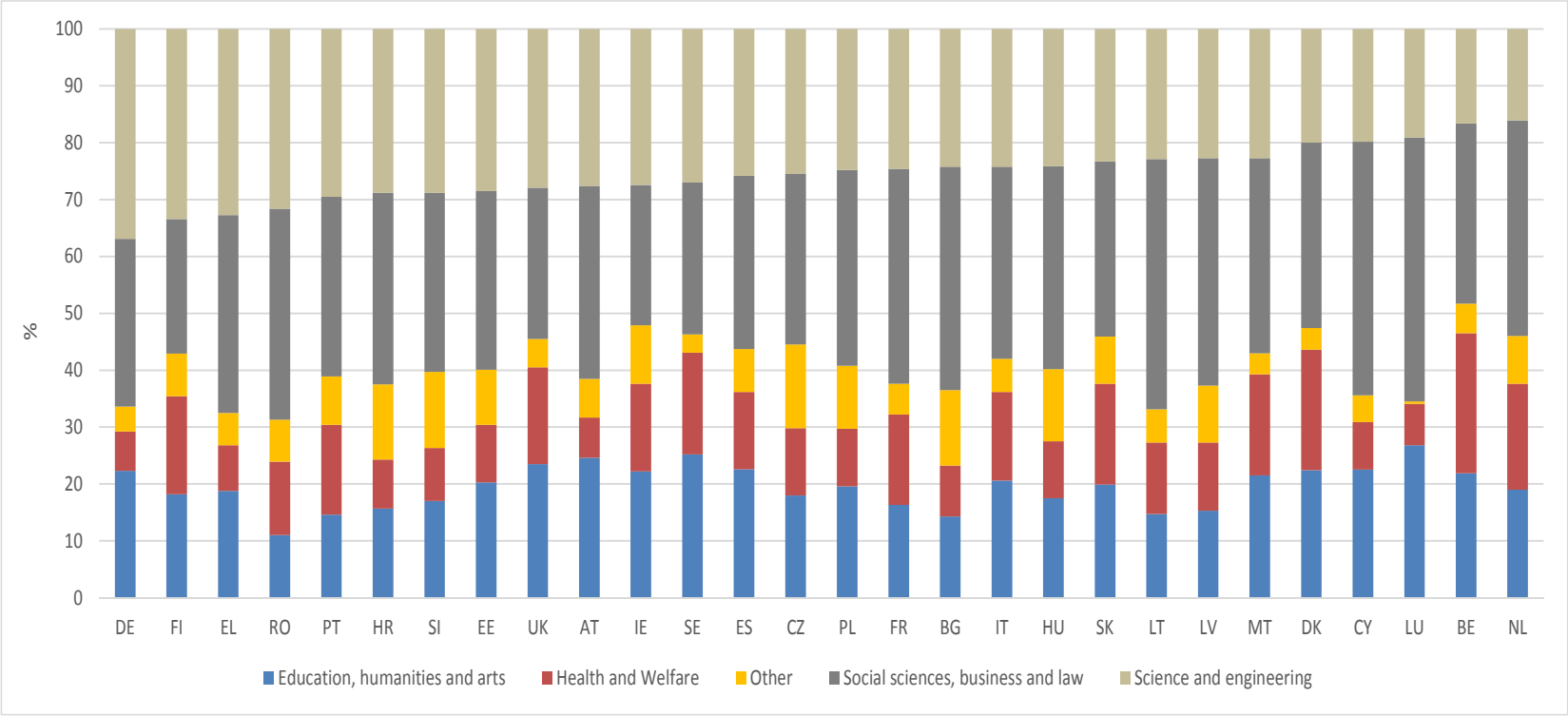
Population aged 25-64 by educational attainment level, 2015



Source: Eurostat

Relatively high share of Croatian students enrolled in the fields of science and engineering at tertiary education level

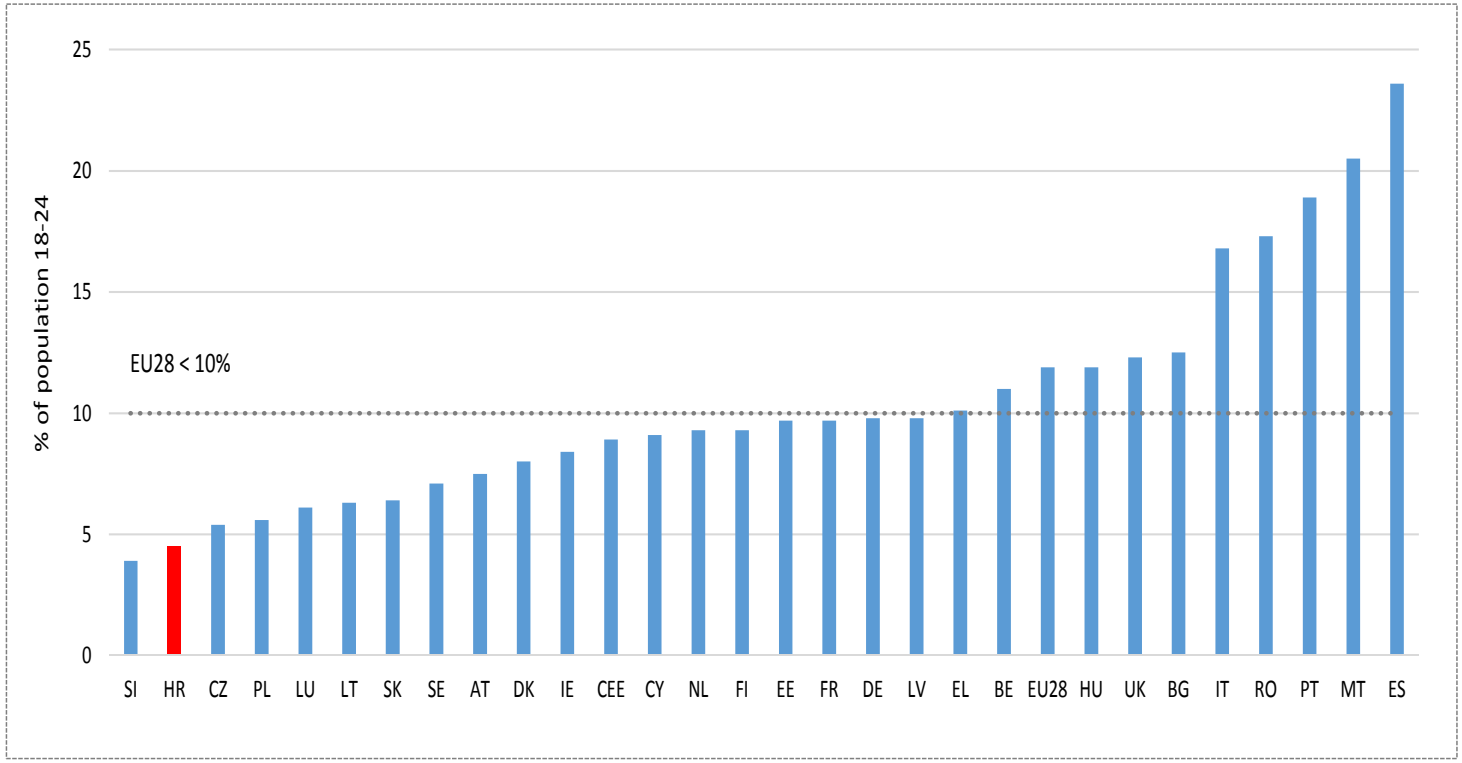
Distribution of students enrolled at tertiary education levels by field of education, 2014



Source: Eurostat

Low share of early school leavers in Croatia compared to the EU and CEE

Early leavers from education and training, 2013

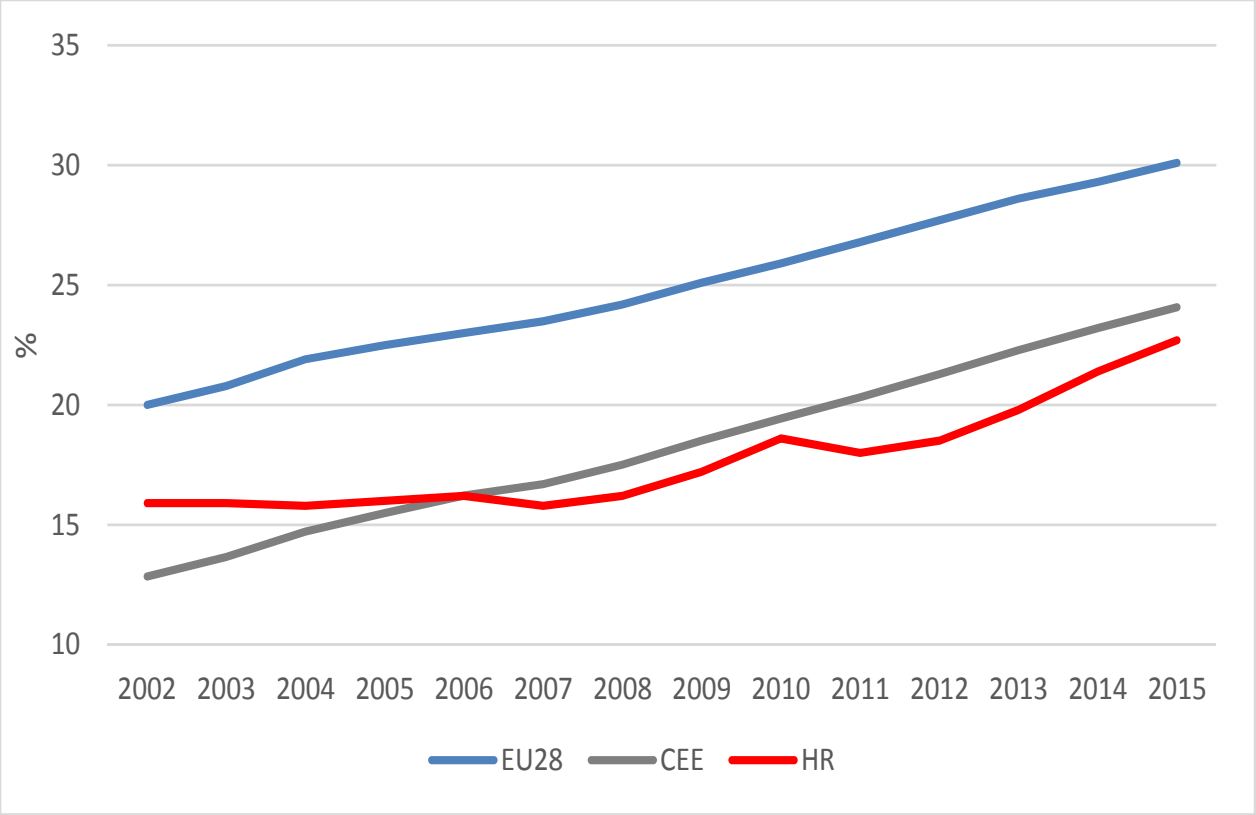


Source: Eurostat

JF1

Increase in completed tertiary education in Croatia smaller than in the EU and CEE – gap increased

Population aged 25-64 with completed tertiary education (2002 – 2015)



Source: Eurostat

Slajd 20

JF1 Josip Funda; 7.6.2016.

Human capital in Croatia – where do we stand compared to other European countries?

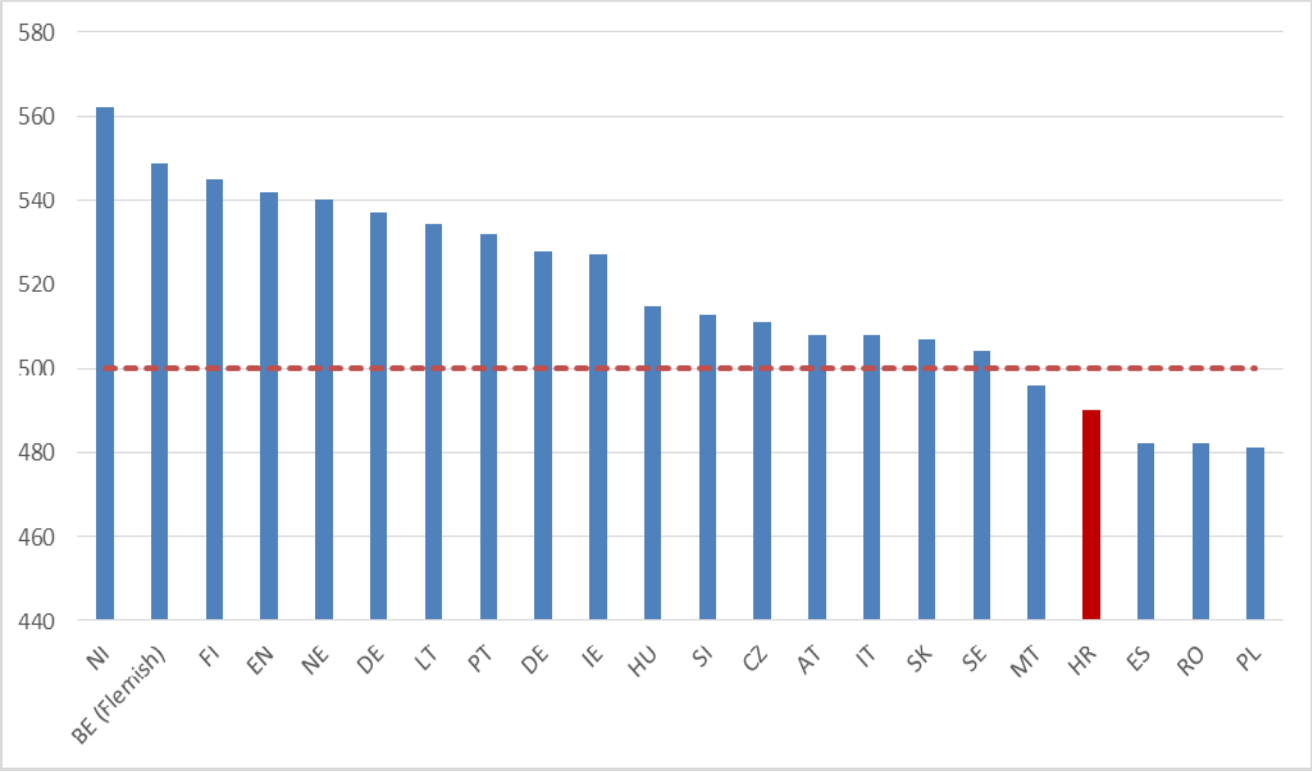
Quality – lagging behind

Potential GDP growth – significantly lower contribution of TFP compared to peers

	Potential output growth rate	TFP contributions to potential output growth rate
Bulgaria		
2003-2008	5,36	2,22
2008-2012	0,82	-0,01
2013-2015	1,66	0,63
Czech Republik		
2003-2008	3,60	2,51
2008-2012	1,15	0,71
2013-2015	1,89	1,11
Croatia		
2003-2008	3,12	**0,70**
2008-2012	-0,74	**-0,45**
2013-2015	-0,15	**-0,22**
Hungary		
2003-2008	2,53	1,06
2008-2012	0,40	-0,15
2013-2015	1,83	0,18
Poland		
2003-2008	4,02	1,94
2008-2012	4,01	0,98
2013-2015	2,77	0,95
Romania		
2003-2008	4,92	3,83
2008-2012	0,83	0,06
2013-2015	2,46	2,20

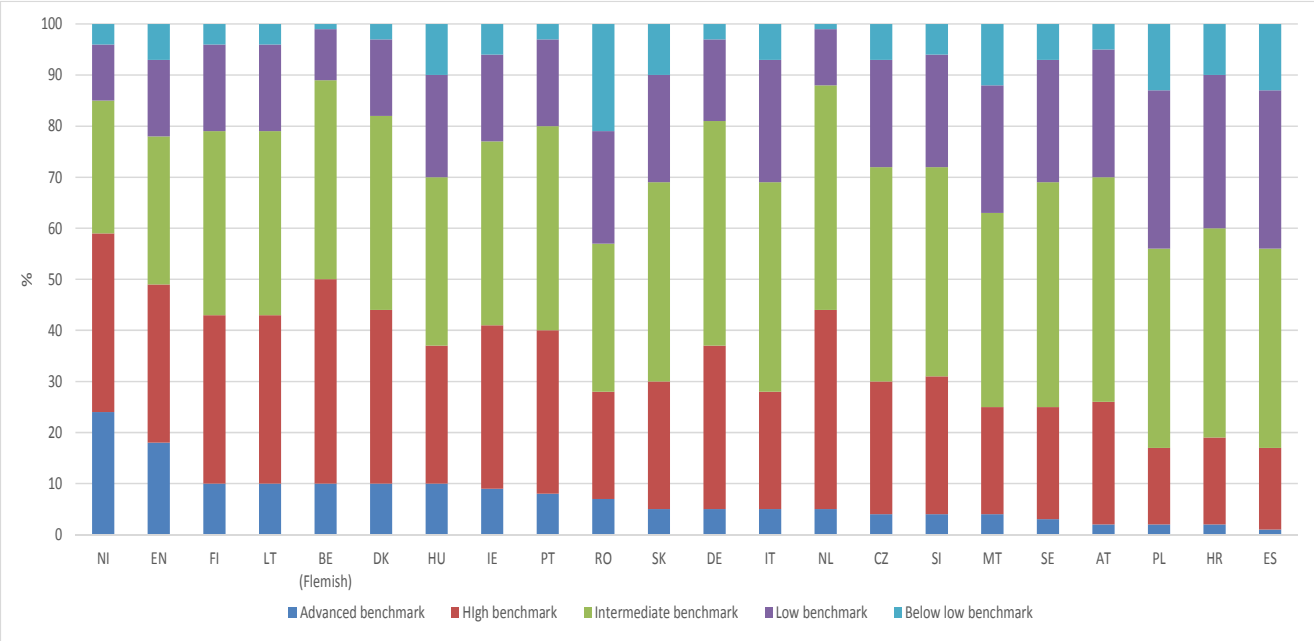
Source: ESCB

Low achievement of Croatia at international tests in mathematics (TIMSS)...



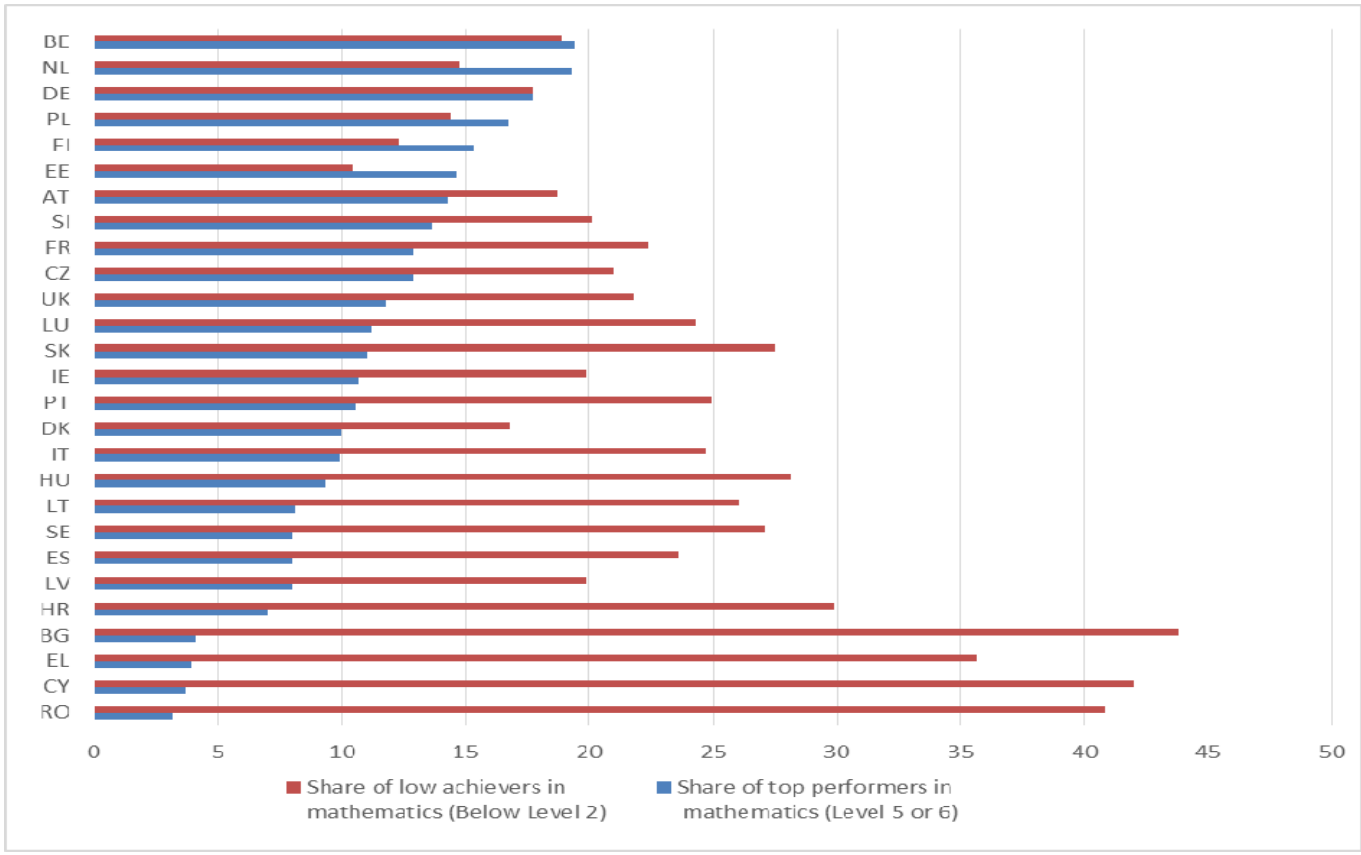
Note: Data refer to 2011
Source: TIMSS & PIRLS International Study Center

...with low share of high performance and high share of below average performance – TIMSS tests



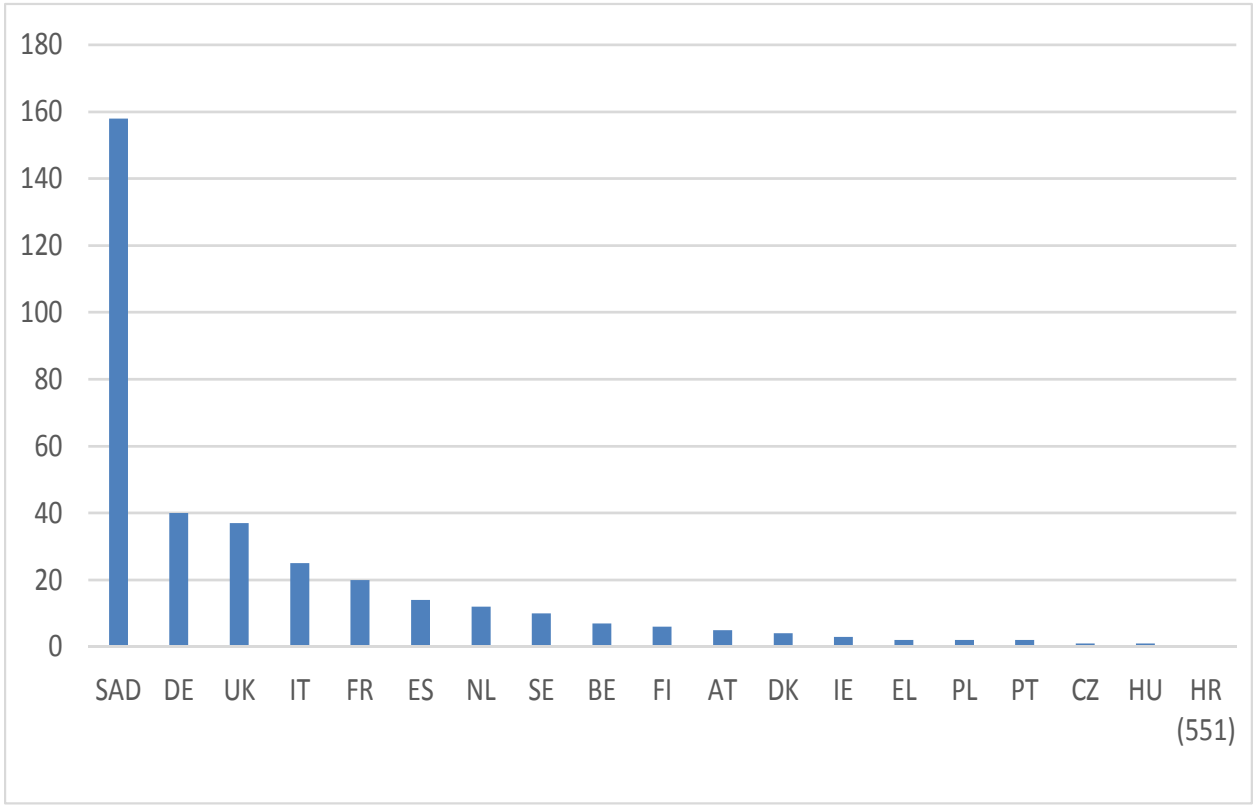
Source: TIMSS & PIRLS International Study Center

PISA tests in mathematics point to the same conclusion



Note: Data refer to 2012
Source: OECD

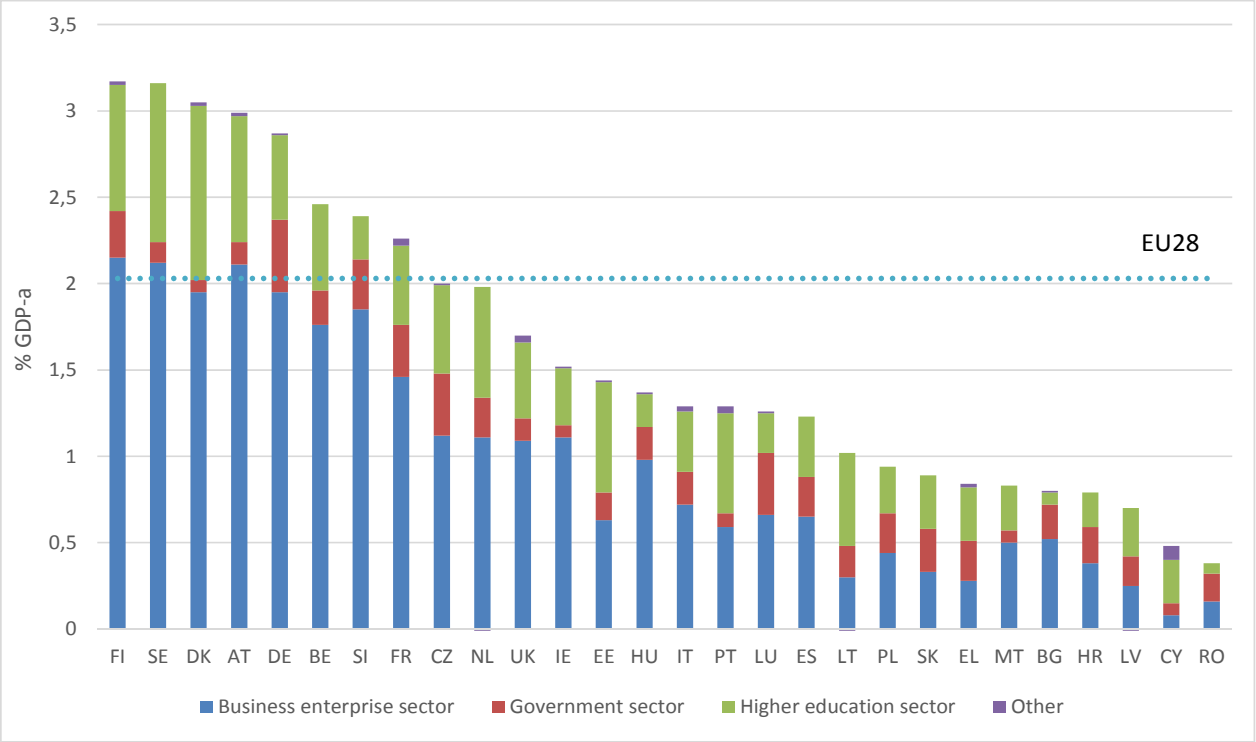
Number of universities in top 500 in the EU and the US, 2015



Source: CWUR

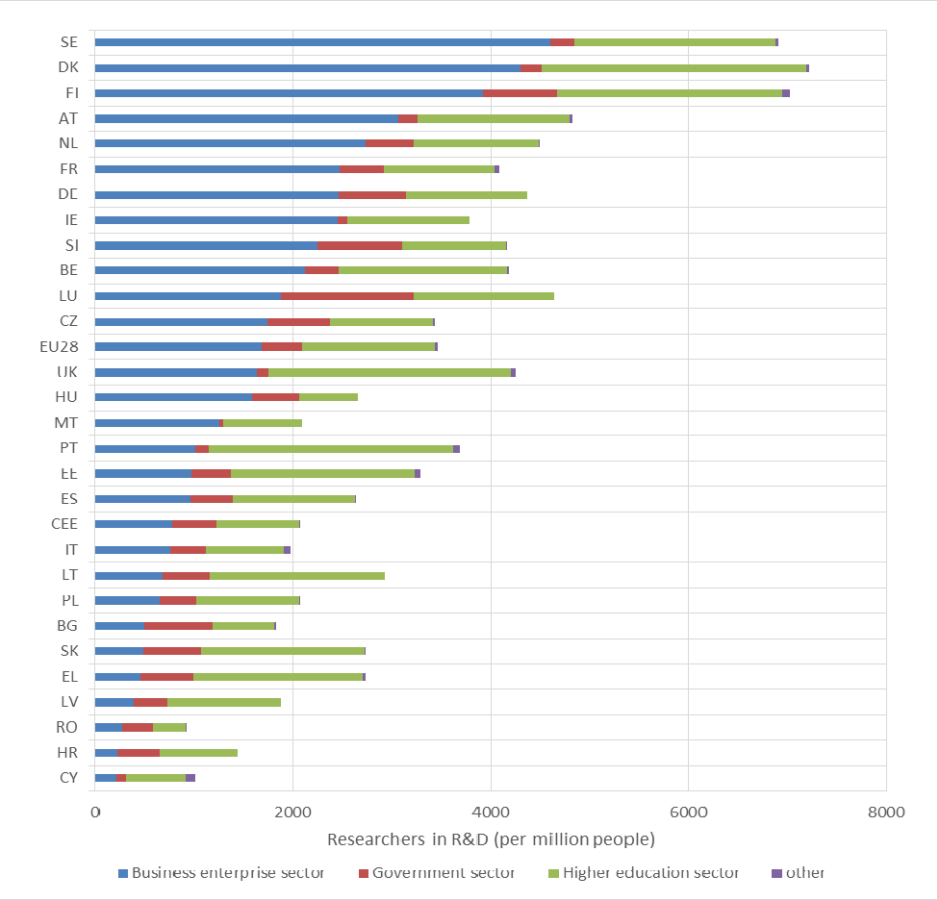
R&D activities...

Total research and development expenditure by sectors of performance, 2014 (% of GDP)



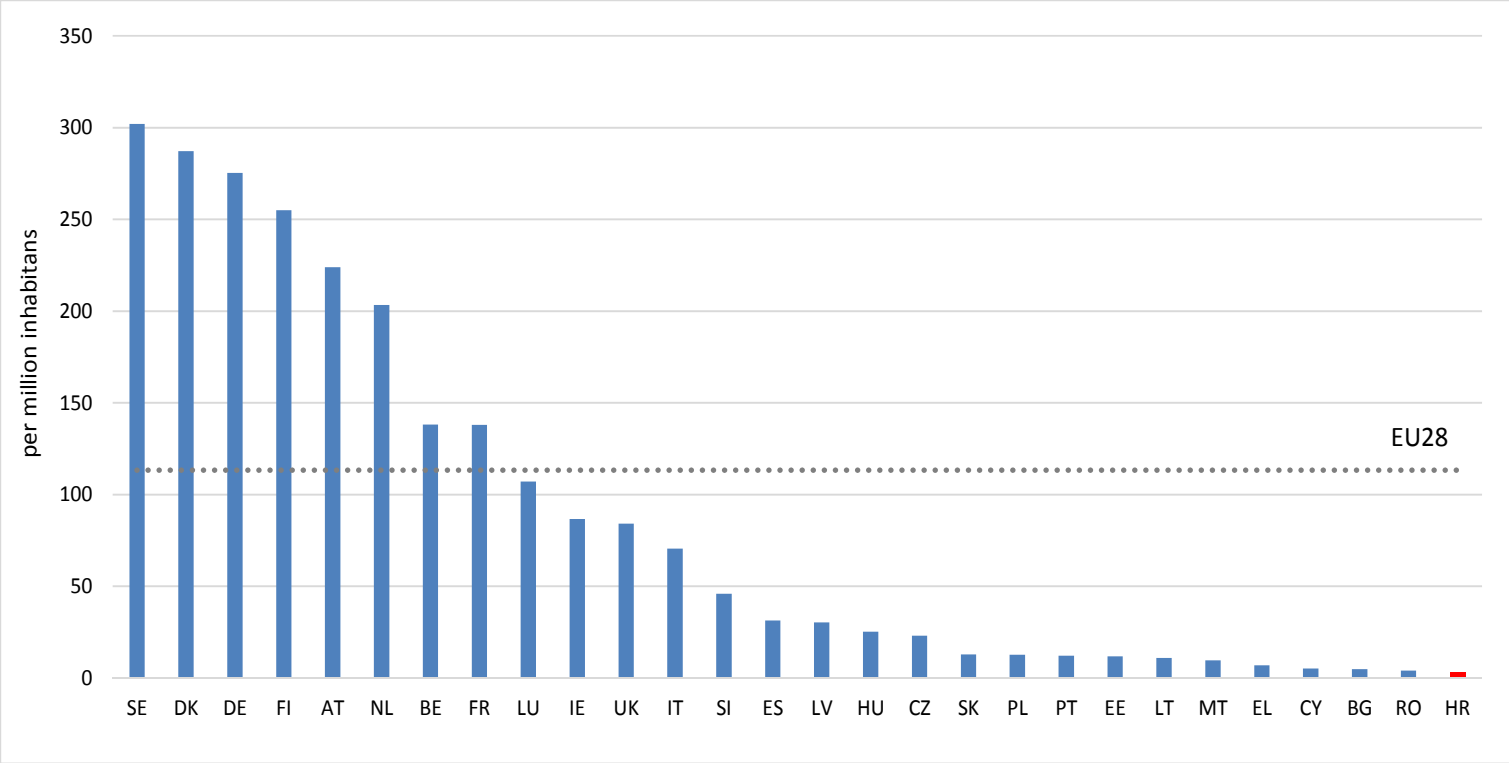
Source: Eurostat

...and R&D researchers...



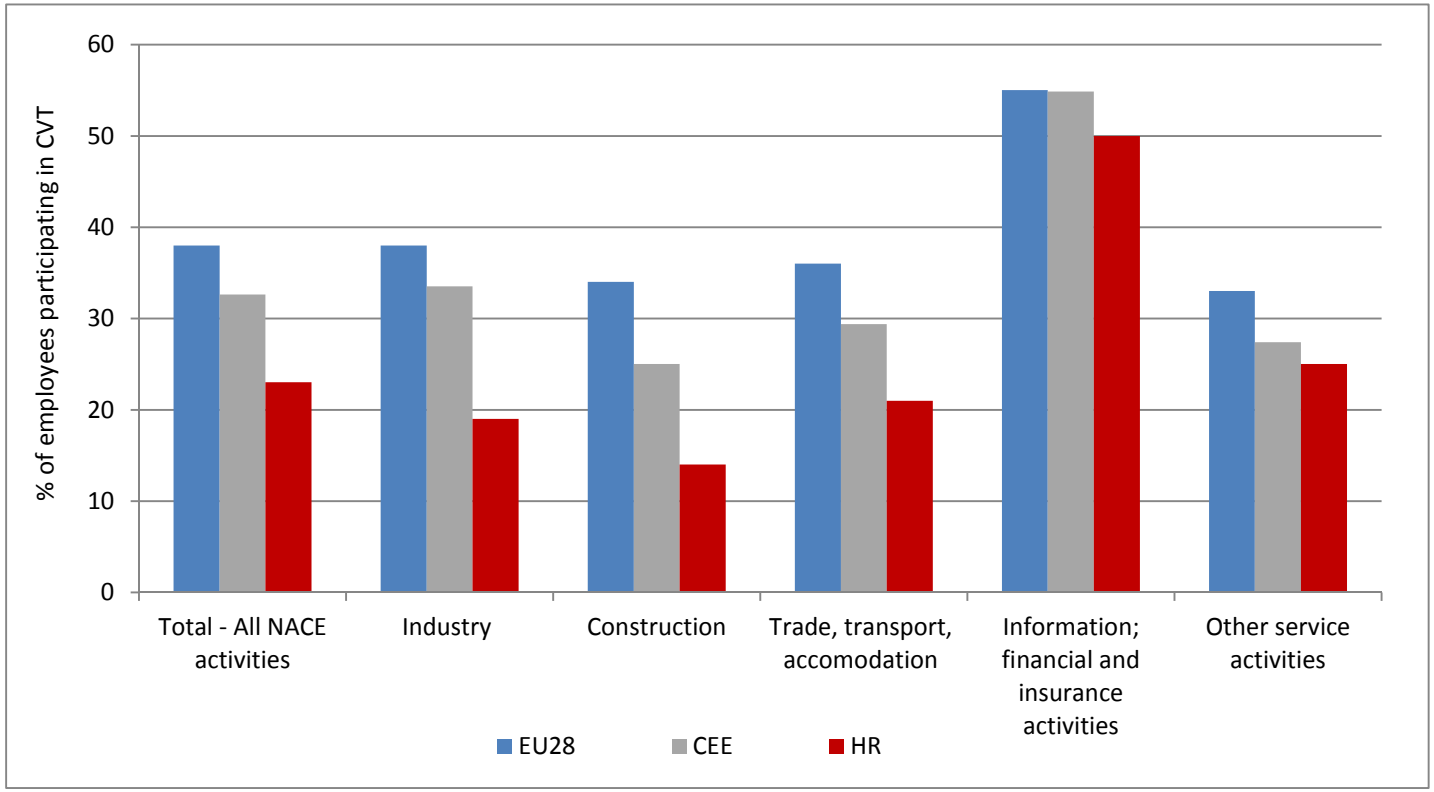
Note: Data refer to 2014.
Source: Eurostat

Patent applications to the European Patent Office (EPO)



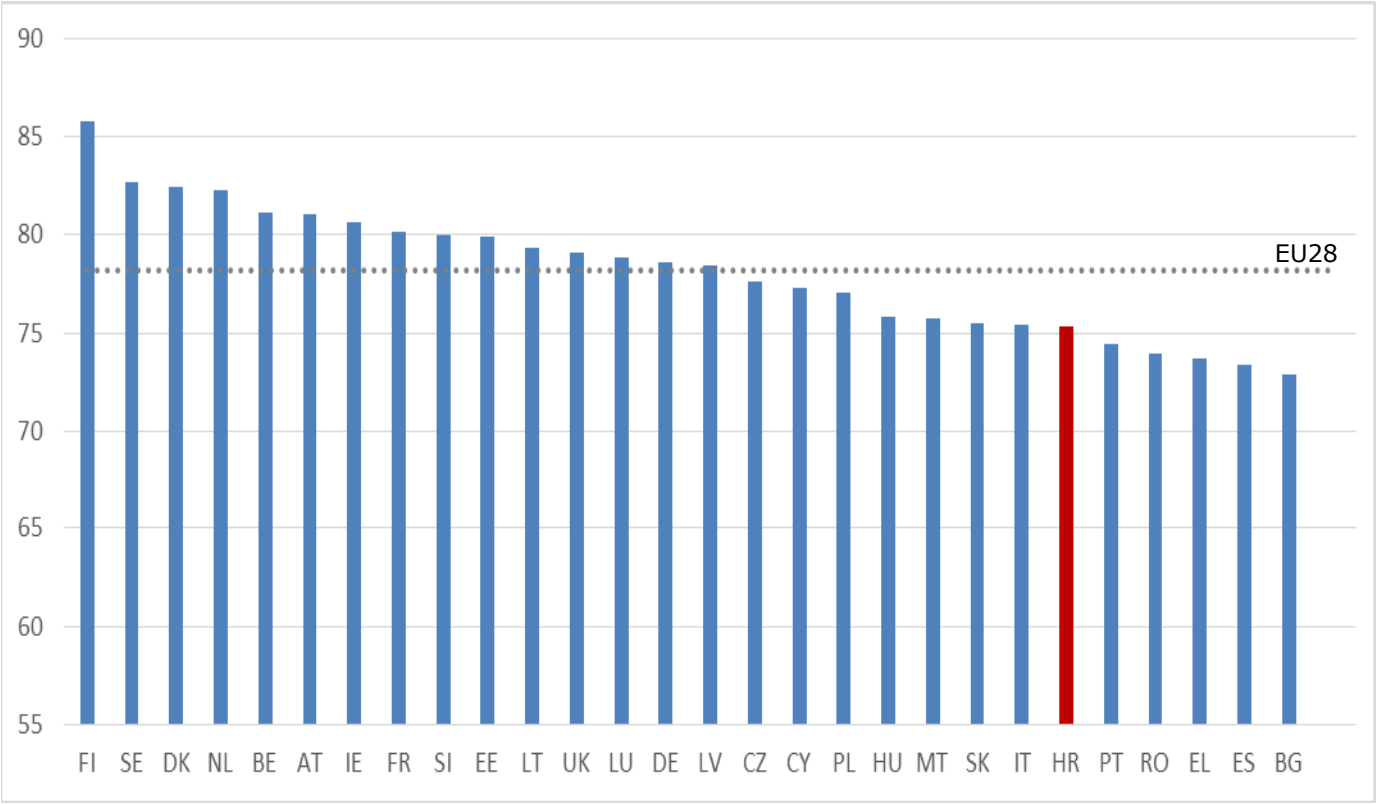
Note: Data refer to 2015
Source: Eurostat

Life-long learning



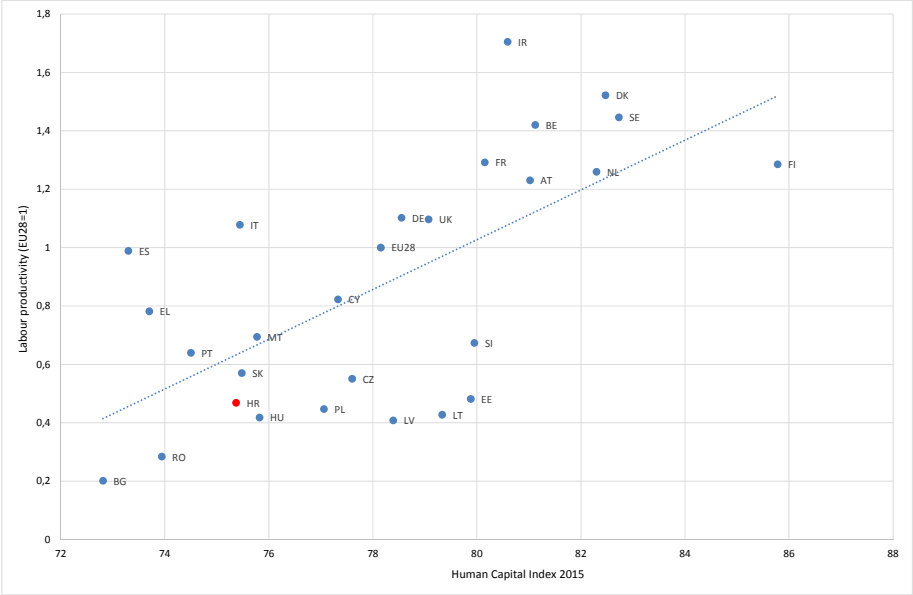
Note: Data refer to 2010.
Source: Eurostat

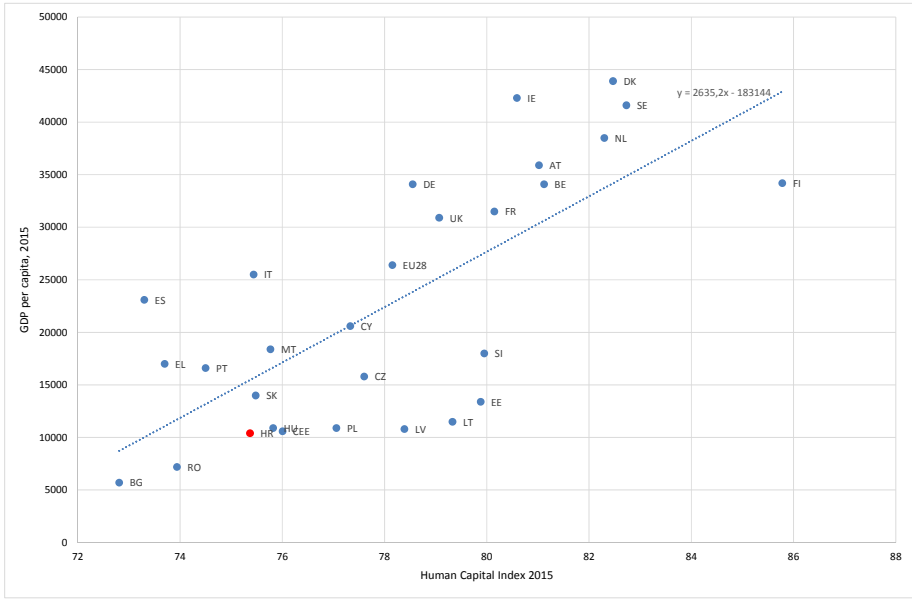
Summary indicator of human capital – Croatia below EU average (2015) which can partly explain...



Source: WEO

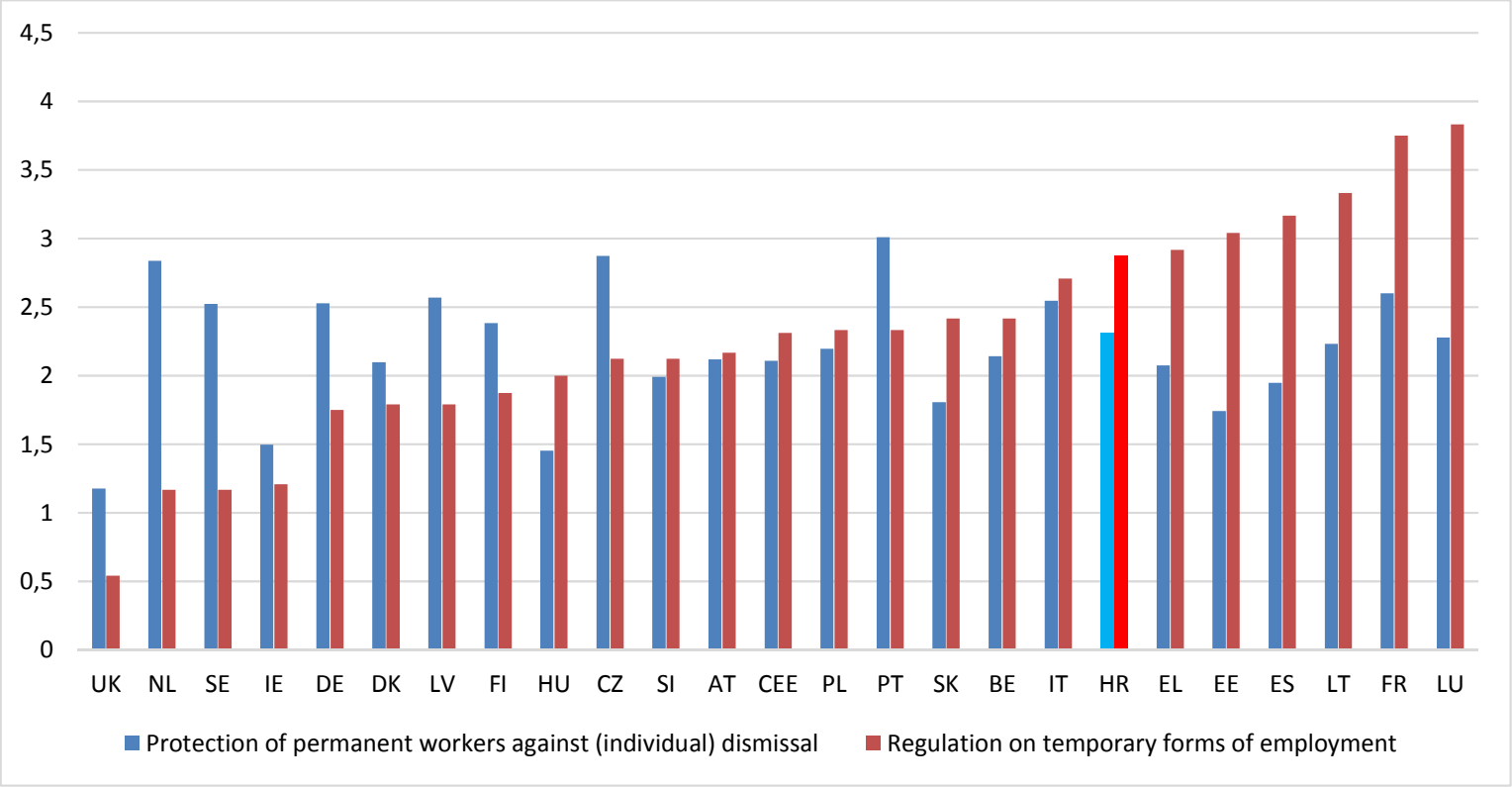
...lower labour productivity and GDP pc





Note: Data refer to 2015
Source: Eurostat, WEO

Labour market institutions – Employment Protection Legislation



Source: OECD

Conclusion

- Economic theory and empirical research confirm importance of human capital for growth;
- Recent research suggests that quality of education is more important than quantity;
- Croatia is close to EU average when it comes to investment in education and training, as well as enrolment ratios in primary and secondary level of education, but lags significantly in terms of outcomes, i.e. quality of education;
- Contribution of total factor productivity to potential growth in Croatia lower compared to peers;
- Appropriate labour market institutions should enable efficient utilization of human capital;
- That points to the need for
  - structural reforms in national education system to foster convergence and potential growth in the medium to long run
  - need of strucural reforms in business sector to promote R&D and transfer of knowledge

Thank you!