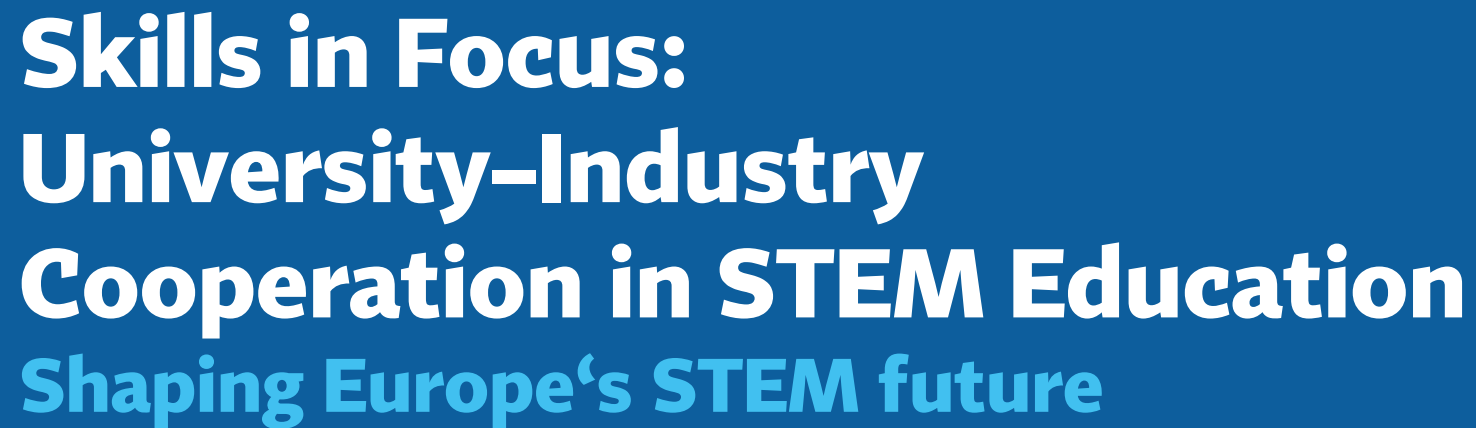




November 19, 2025 Prague



Aims of presentation



societal challenges in the era of technology

- in the era of rapid technological transformation & global competition

advancing STEM education & research

- through industry links & international cooperation

building future ready engineers

- skills for technical excellence

strengthening talent pipelines in Europe

- supporting talent circulation and competitiveness

anchoring innovation in regional ecosystems

- driving innovation through industrial partnership & business development

Societal Challenges in the Era of Technology



strategic documents

Enrico Letta, The 5th freedom to enhance RI&E in the Single Market

free movement of labour | capital | goods | services + research & knowledge

Manuel Heitor, Align, Act, Accelerate. RT&I to boost EU competitiveness

research, technological development, innovation, infrastructure, excellence

Mario Draghi, The future of European Competitiveness

competitiveness, productivity, closing skills and innovation gaps...

Czech Republic, National Economic Strategy + Sector Strategies

semiconductors, energy, AI, quantum technologies, aerospace,...

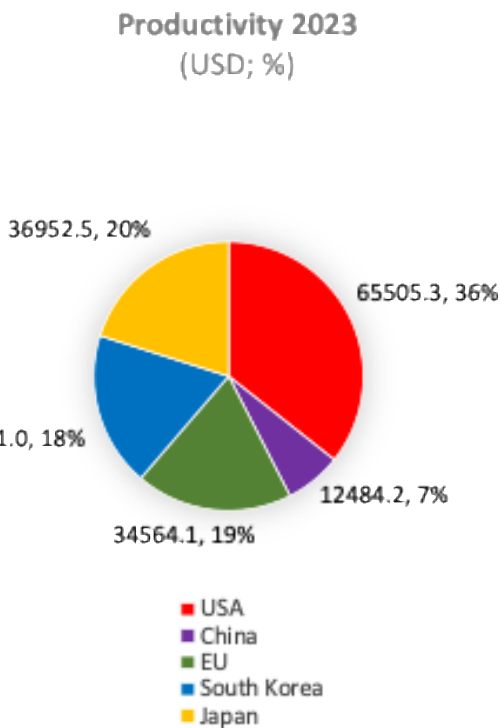
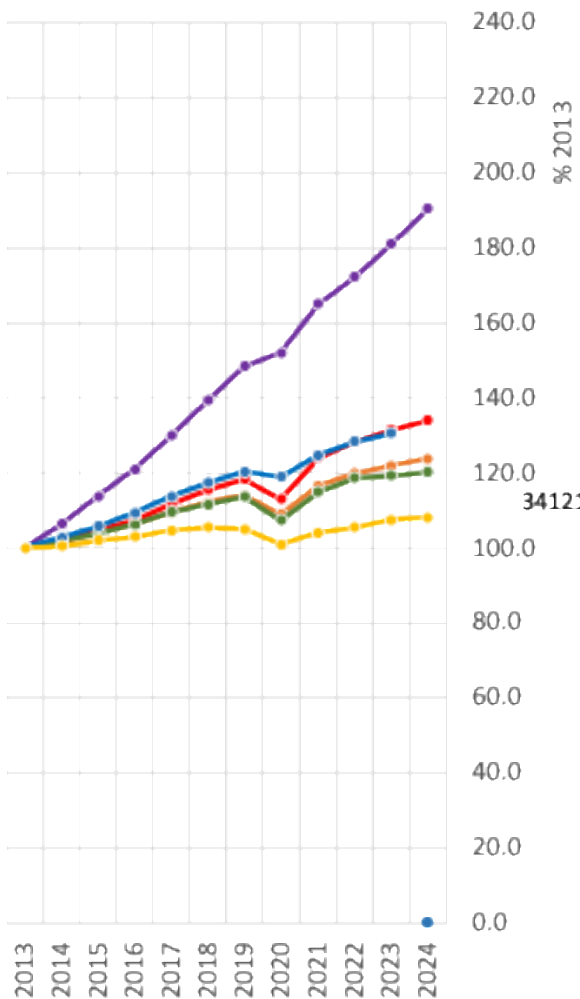
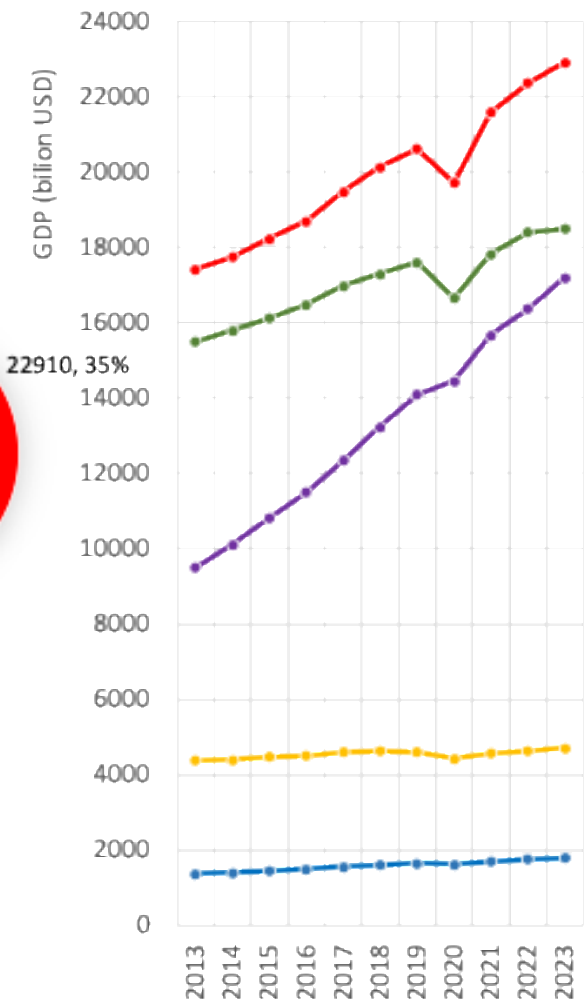
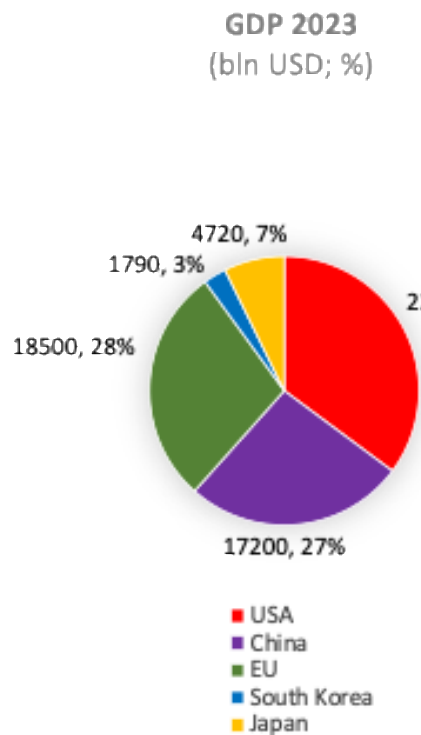
key words

- competitiveness,
- productivity,
- **RDI (research, development & innovations):** excellence, effectiveness, transfer,
- qualified labour,
- **STEM education,**
- **investments – infrastructure**
- +
- **sustainability**
- **defence**

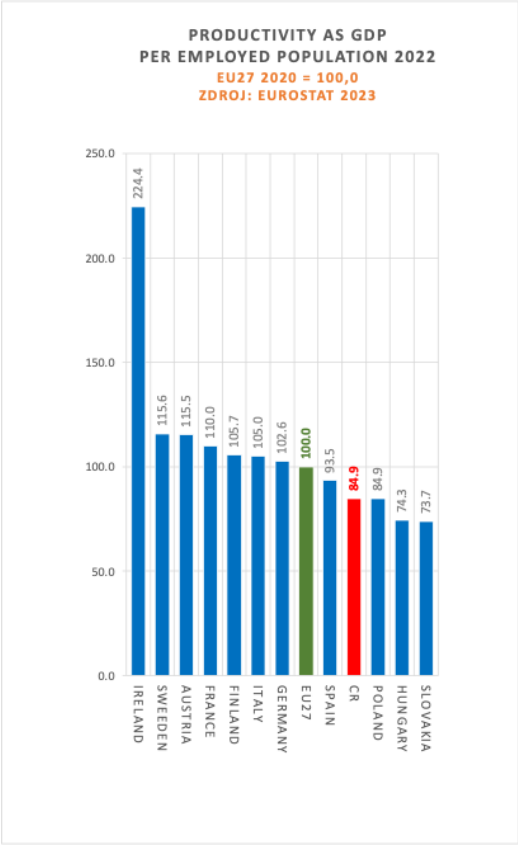
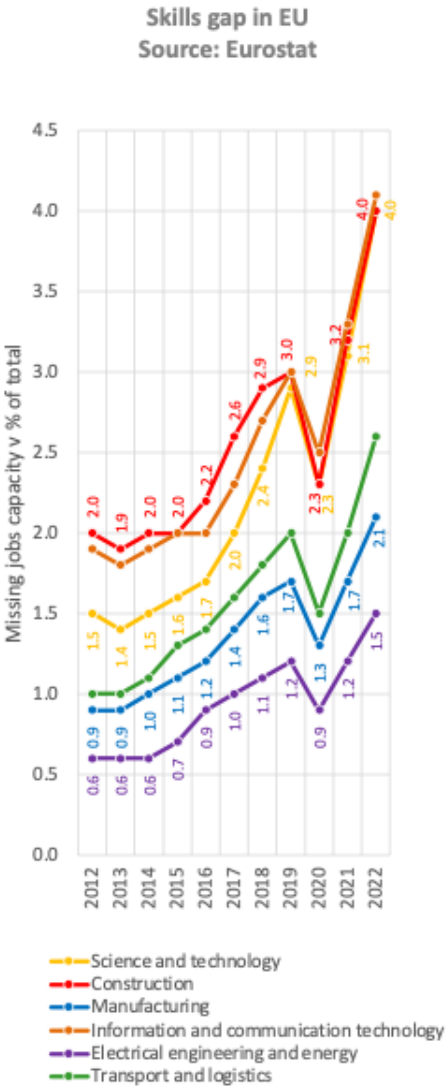
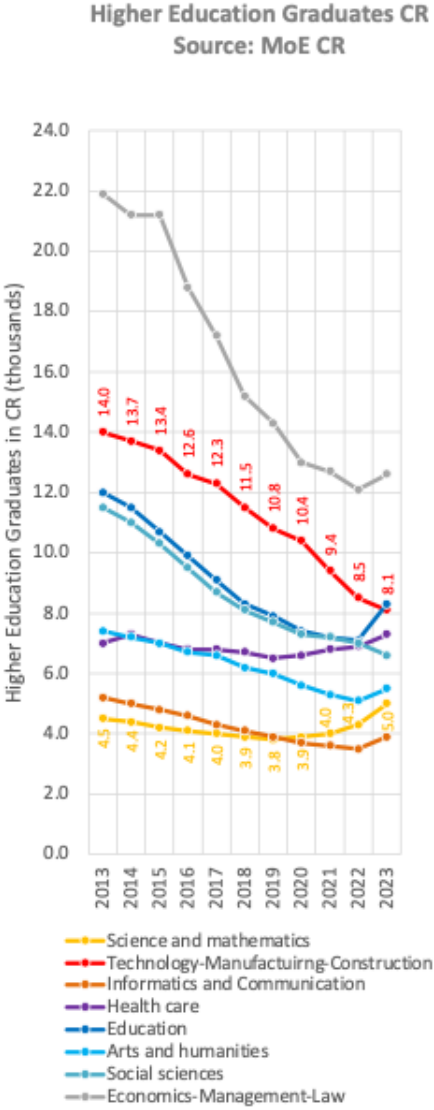
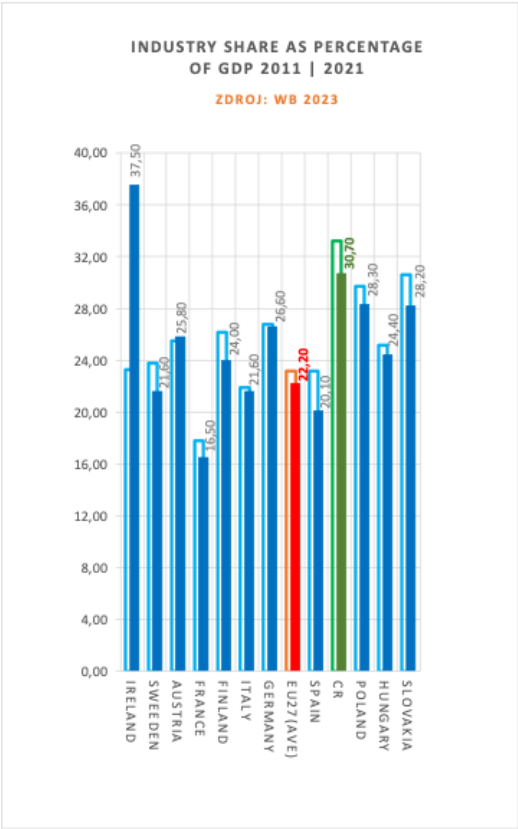
economy with

- high added value based on
- knowledge & innovations

Productivity



Skills gap

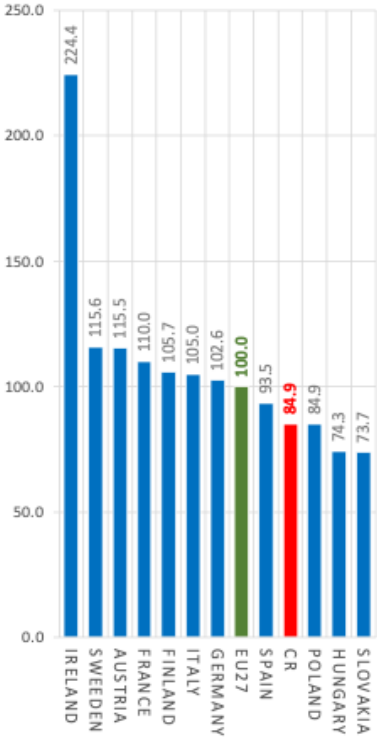


Societal Challenges in the Era of Technology

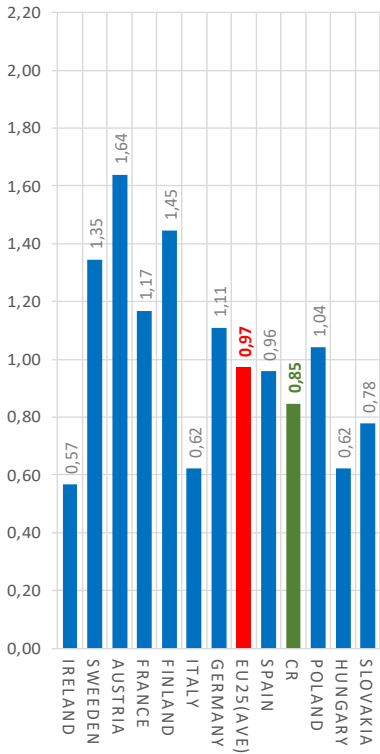
productivity & tertiary education spending



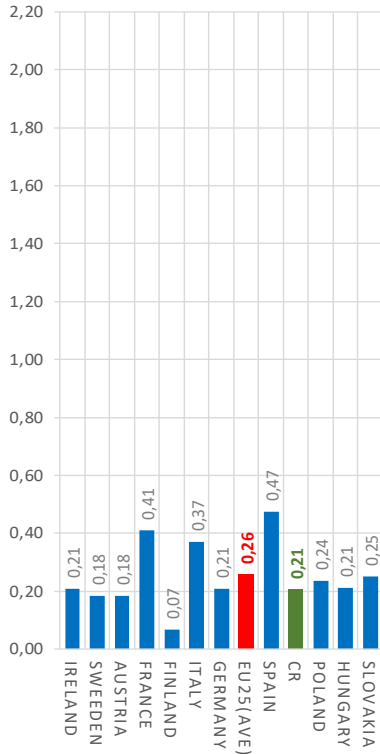
PRODUCTIVITY GDP
PER EMPLOYED POPULATION 2022
EU27 2020 = 100,0
SOURCE: EUROSTAT 2023



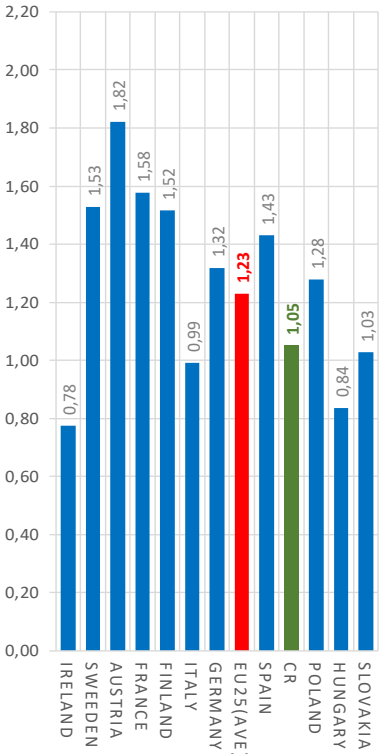
PUBLIC SPENDING ON
TERTIARY EDUCATION AS PERCENTAGE
OF GDP 2021
ZDROJ: OECD 2023



PRIVATE SPENDING ON
TERTIARY EDUCATION AS PERCENTAGE
OF GDP 2021
ZDROJ: OECD 2023



PUBLIC AND PRIVATE SPENDING ON
TERTIARY EDUCATION AS PERCENTAGE
OF GDP 2021
ZDROJ: OECD 2023

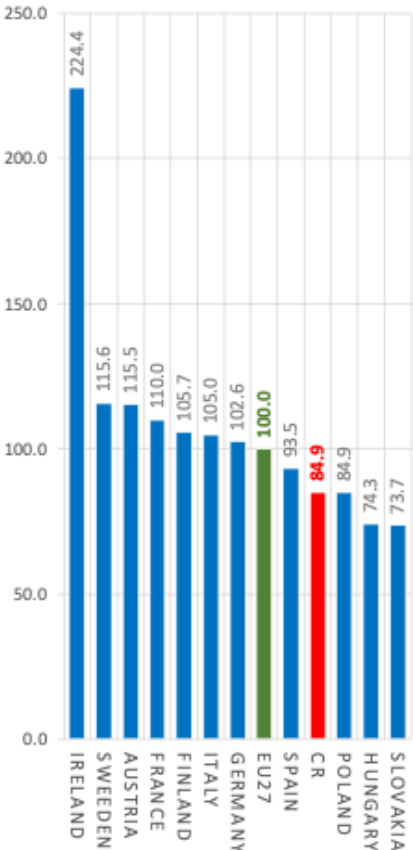


Societal Challenges in the Era of Technology

productivity & research spending



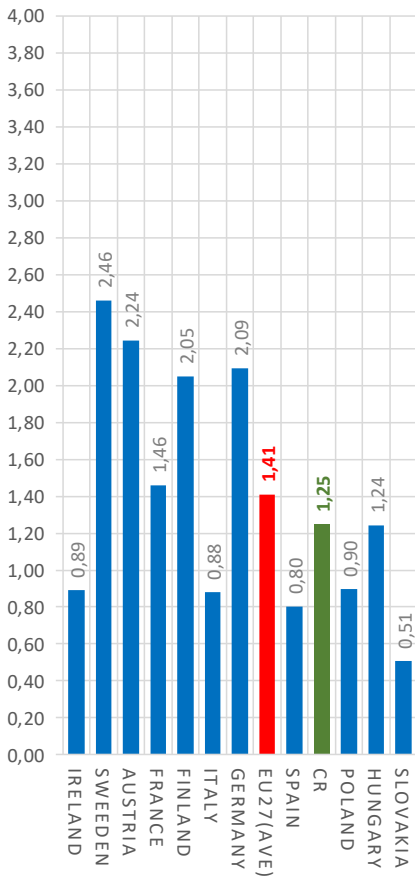
PRODUCTIVITY GDP
PER EMPLOYED POPULATION 2022
EU27 2020 = 100,0
SOURCE: EUROSTAT 2023



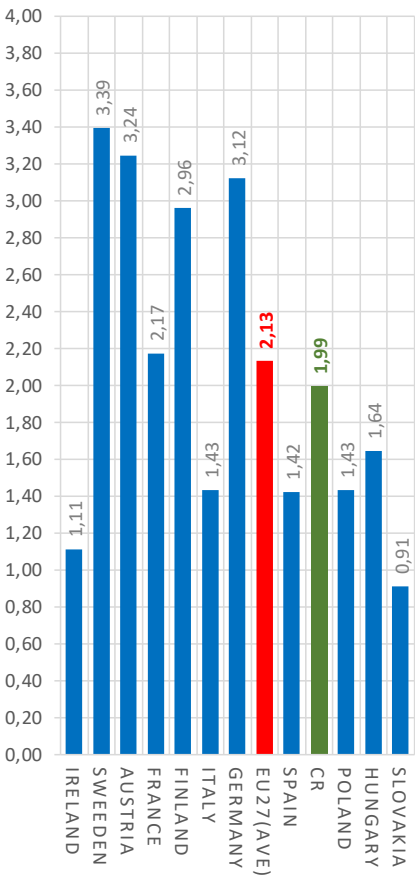
RESEARCH PUBLIC SPENDING
AS PERCENTAGE OF GDP 2021
ZDROJ: OECD 2023



RESEARCH BUSINESS SPENDING
AS PERCENTAGE OF GDP 2021
ZDROJ: OECD 2023

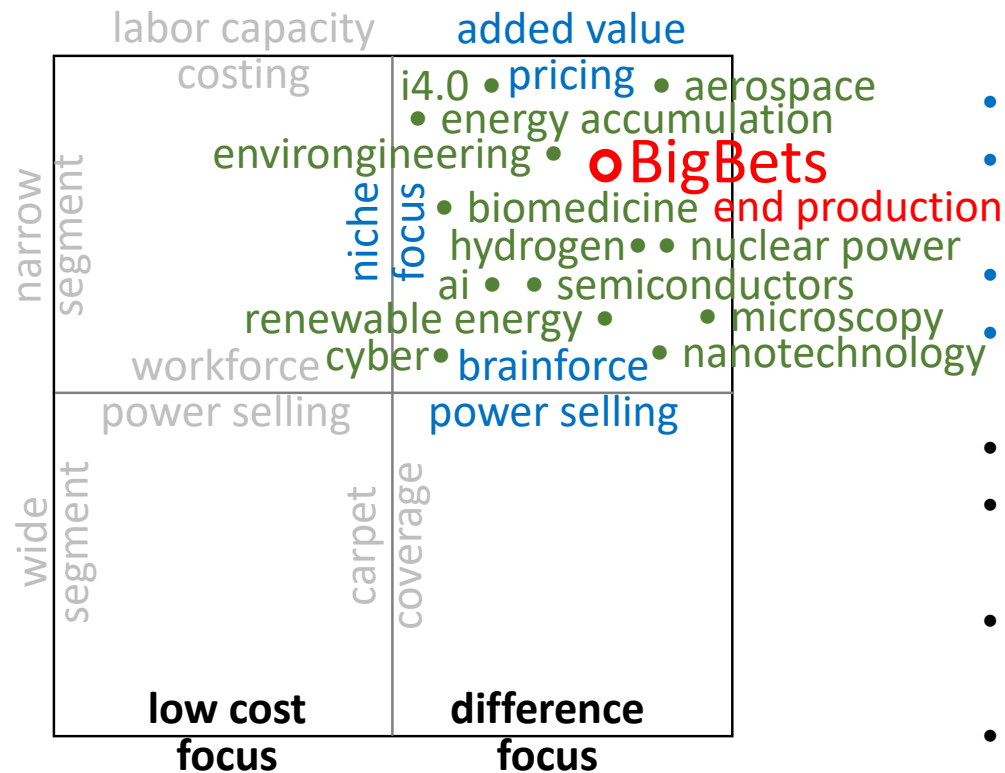


RESEARCH TOTAL SPENDING
AS PERCENTAGE OF GDP 2021
ZDROJ: OECD 2023



New economy

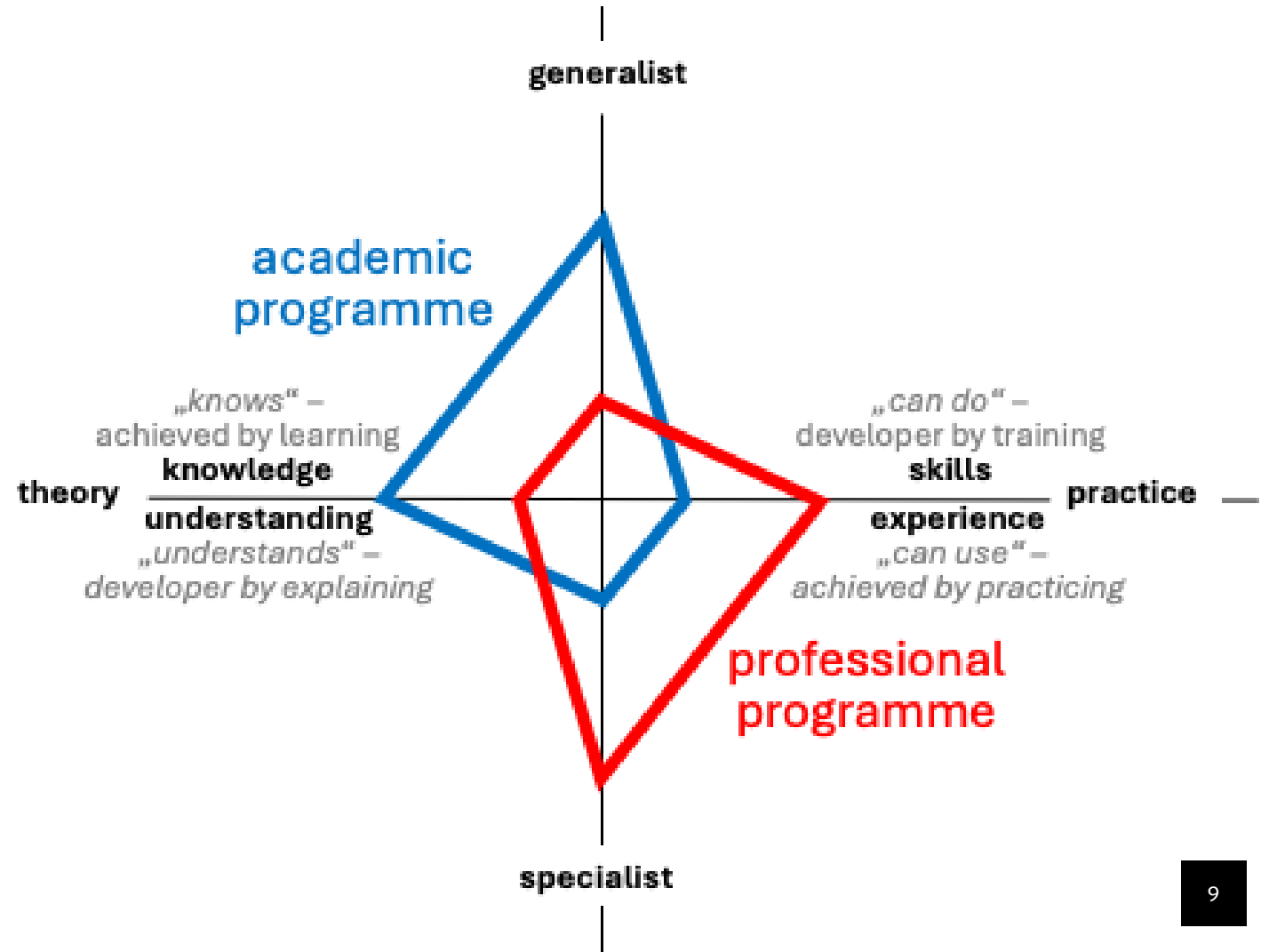
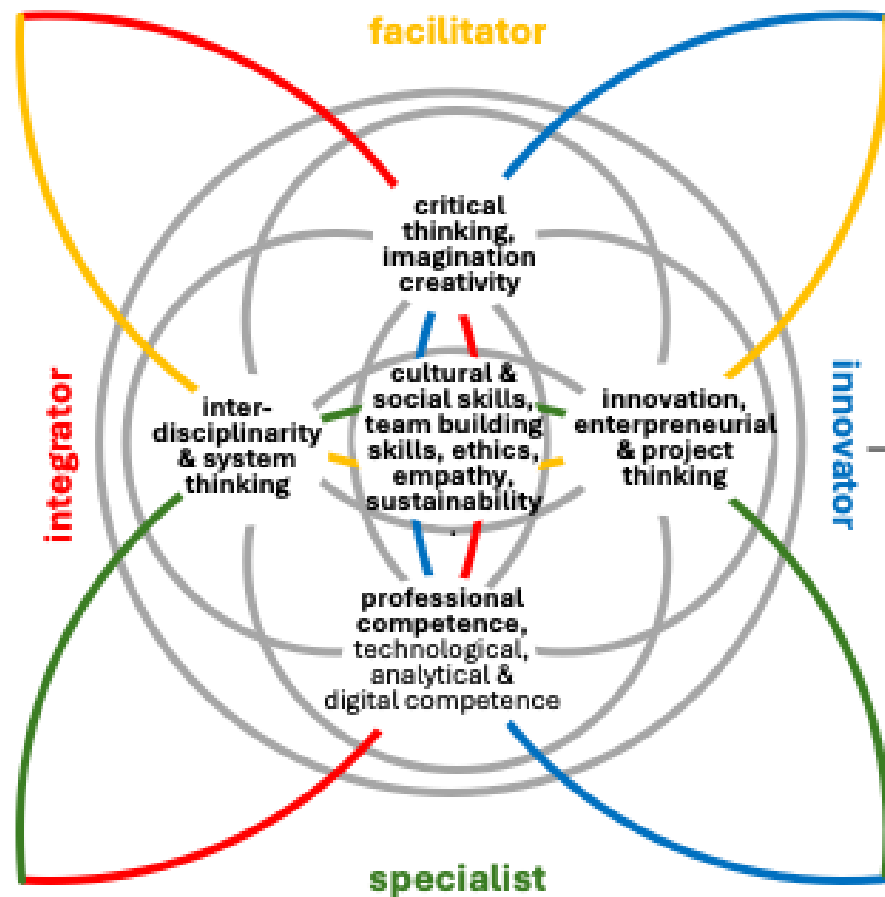
strategies for competitiveness of national economies



- **economy with added value based on knowledge & innovations**
(*culture of entrepreneurship and success*)
- **qualified labour**
- **modern quality education supporting entrepreneurship and innovations** (*general transdisciplinary and transferable skills*)
- **continuing professional development**
- **research-development-innovations + effectiveness, knowledge usage and transfer**
- **digitalisation of the public sector**
- **quality of entrepreneurial environment**
(*rational regulation and administration, predictable taxes,...*)
- **strategic infrastructure** (*energy, digital, transport, research,...*)
- **safety and security** (*economic, raw materials, energetic, knowledge...*)
- **capital availability and strategic investments**
- **sustainability and decarbonisation**

Building Future Ready Engineers

new concepts of STEM studies



Building Future Ready Engineers

new concepts of STEM studies – surveys summary

societal needs & employers needs

- industry involvement in design & evaluation

internationalisation of studies

design based tightly on educational needs

balancing and addressing

- high failure ratio of STEM studies – reforming teaching mathematics & relatives
- reflection of psychography, demography,
- women in STEM
- number of study programmes
- study programmes as the products
- interest & demand in STEM studies
- STEM & hum-soc competences
- professional & transferable skills –
- critical & analytical thinking, creativity, imagination, Innovation thinking, problem solving & system thinking, project management & teamwork, entrepreneurial thinking

breadth of knowledge

depth of specialisation

role of teachers

- *passive vs. activation*
- *problem solving;*
- *artificial intelligence*

knowledge breadth vs|& specialisation depth

- *T profile* (David Gest 1991)

- *generalist vs|& specialist;*

expectations of students

- *customer vs|& co-creator;*
- *higher electivity;*
- *flexibility in modes of delivery*

expectations of graduates & employers

- *employees vs|& „entrepreneurs“*

challenge-based learning

transferable & compatible creditting

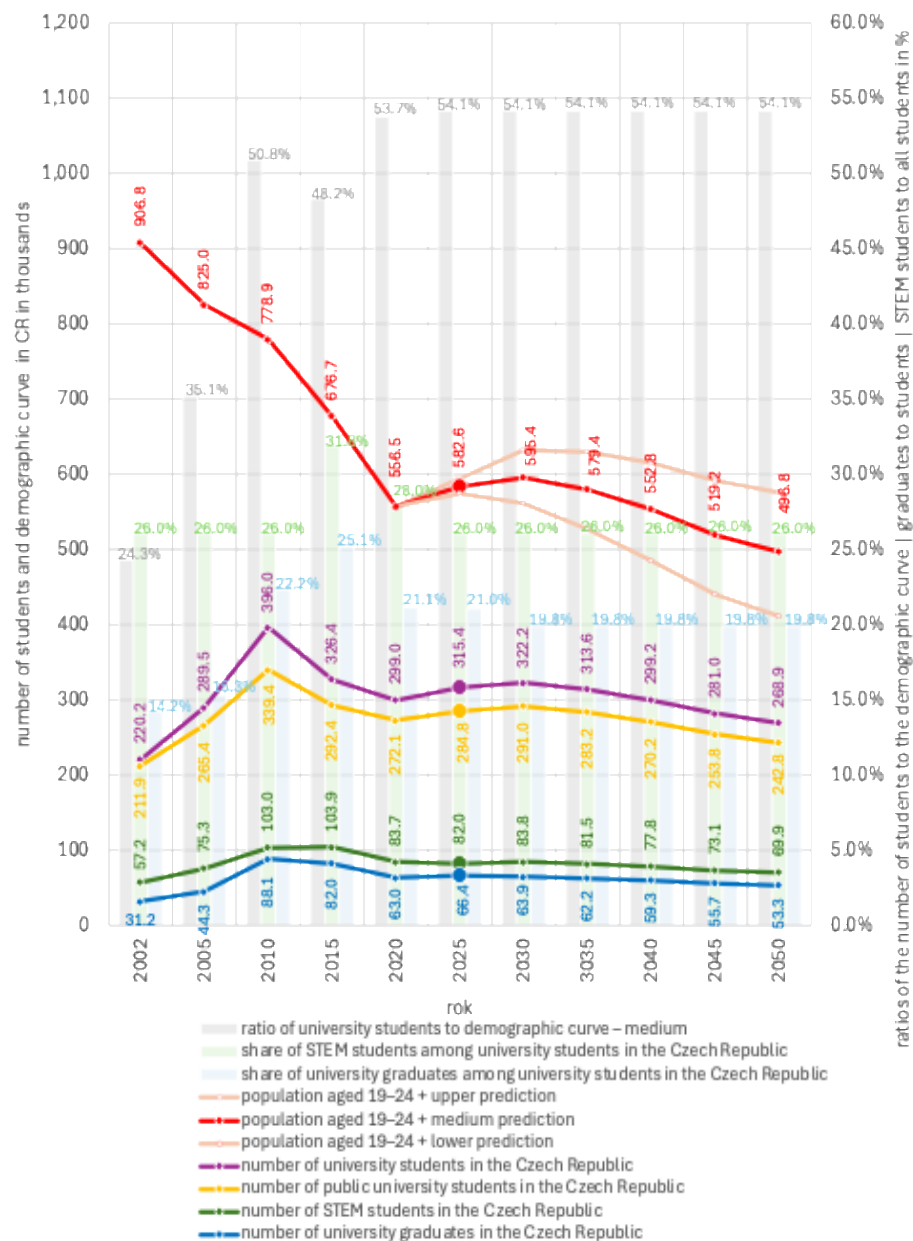
module-based vs subject-based desing for flexible mobility & internationalisation

regular vs|& continuing education,

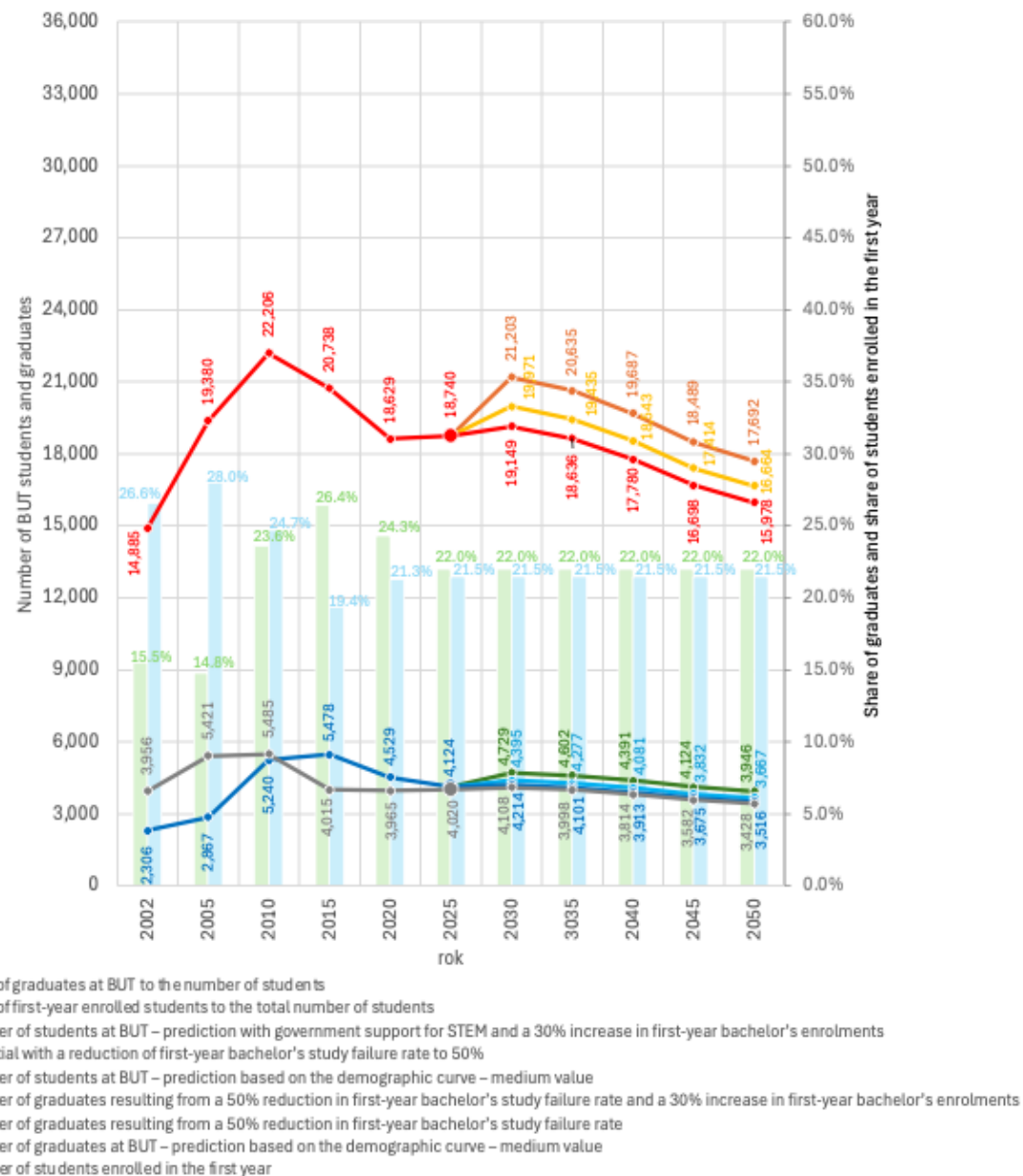
teachers of STEM for secondary schools



Demographic curve and number of higher education students in CR

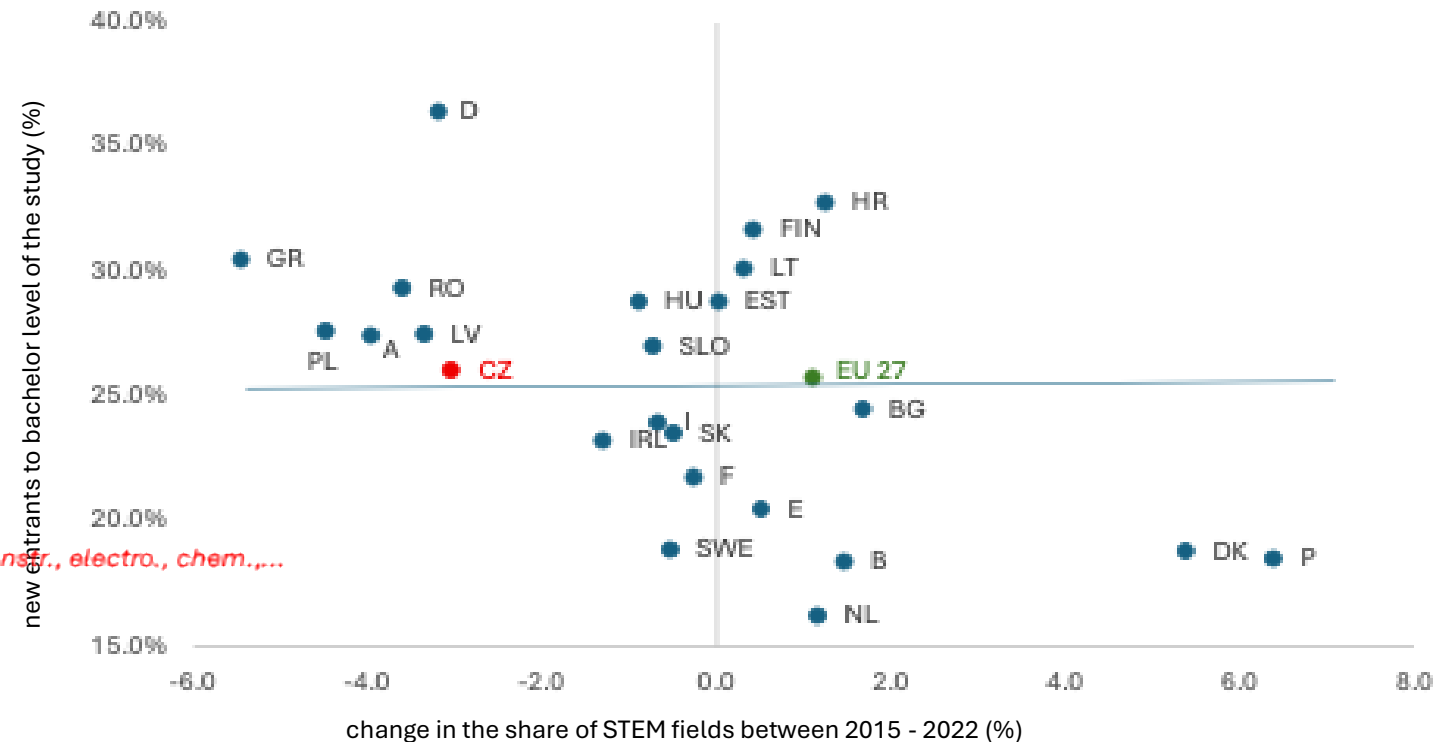
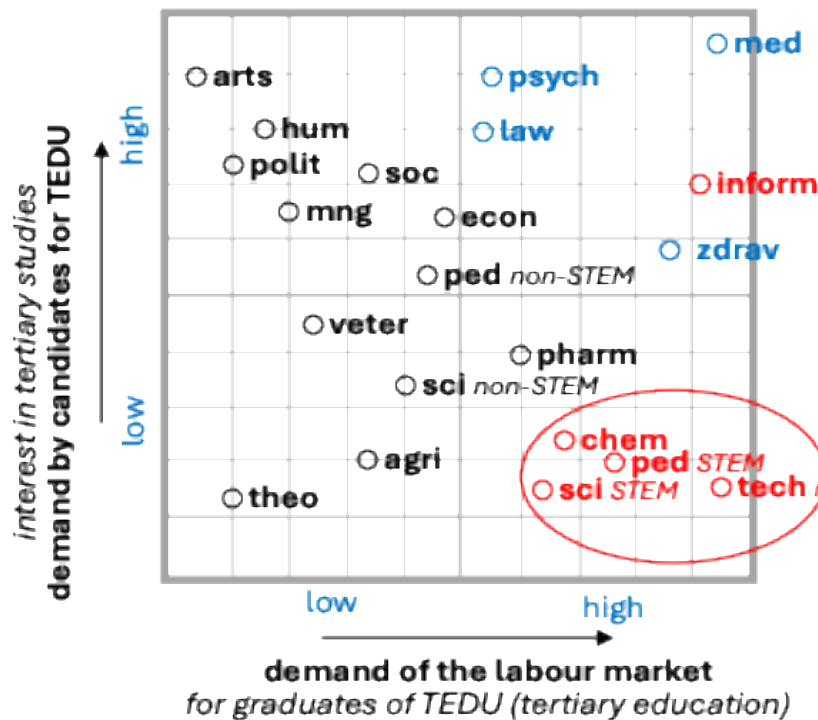


Number of students and graduates at BUT with projection up to 2050



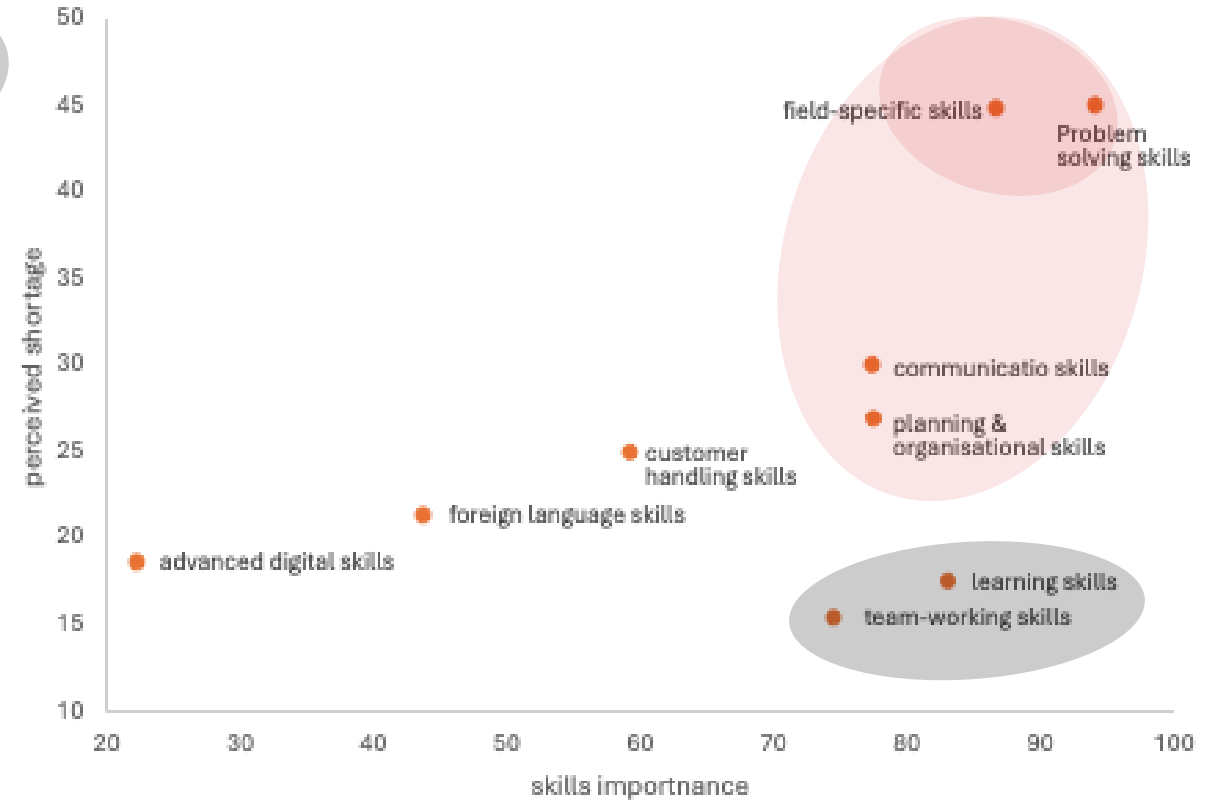
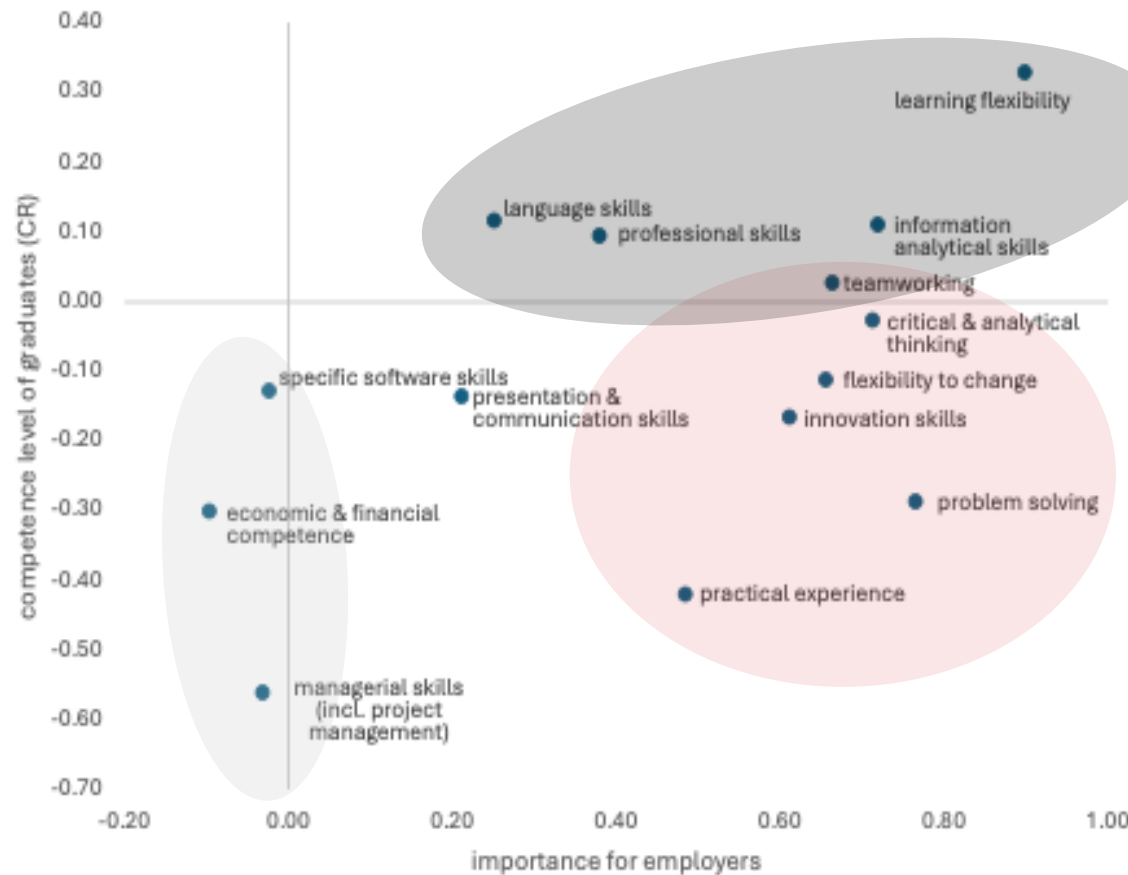
Building Future Ready Engineers

STEM needs & demand



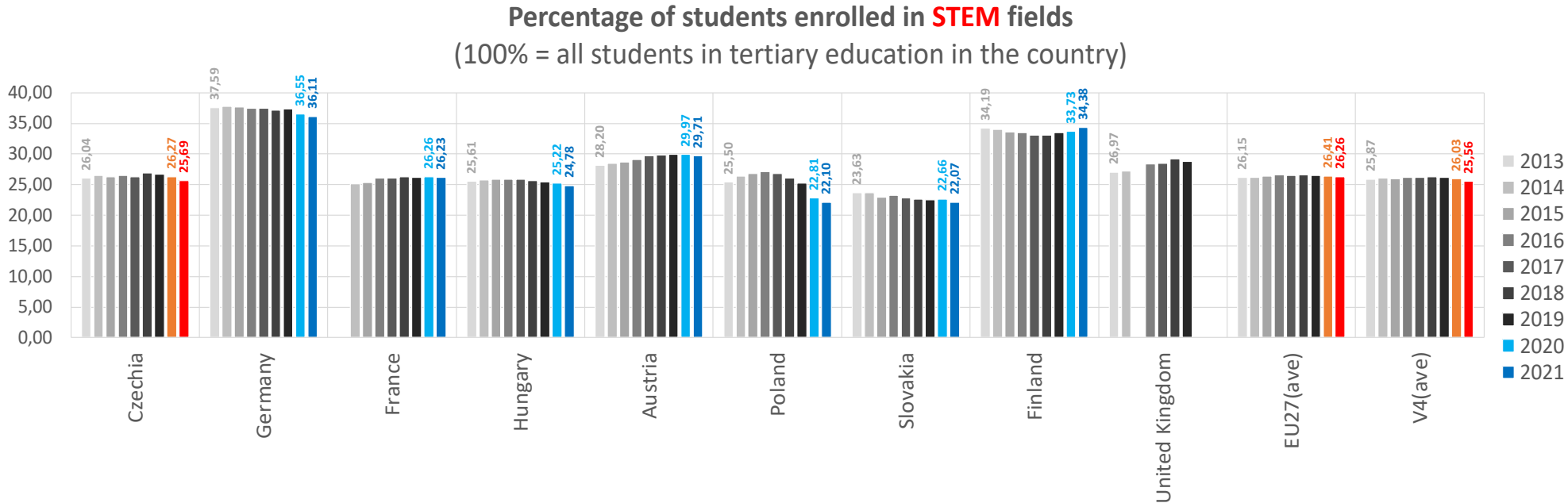
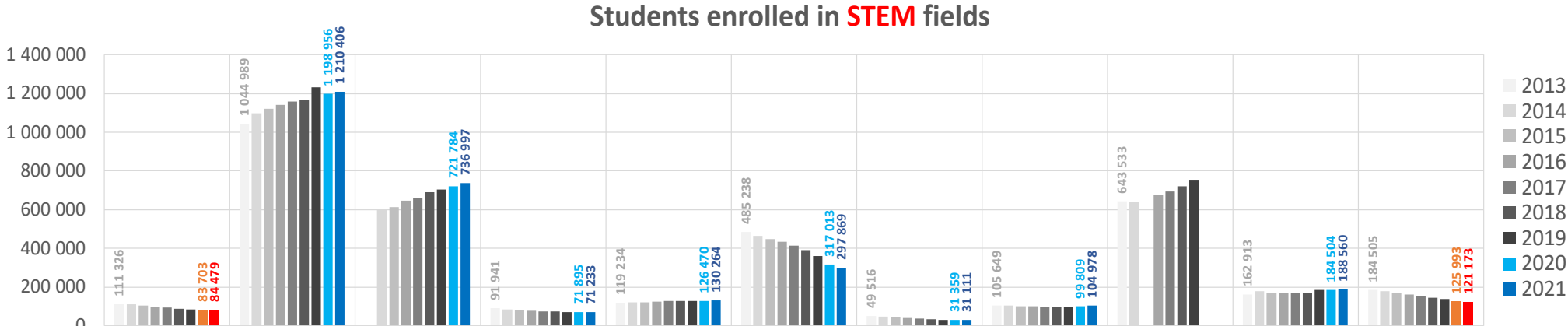
Building Future Ready Engineers

STEM graduate skills profile demand



Building Future Ready Engineers

STEM statistics



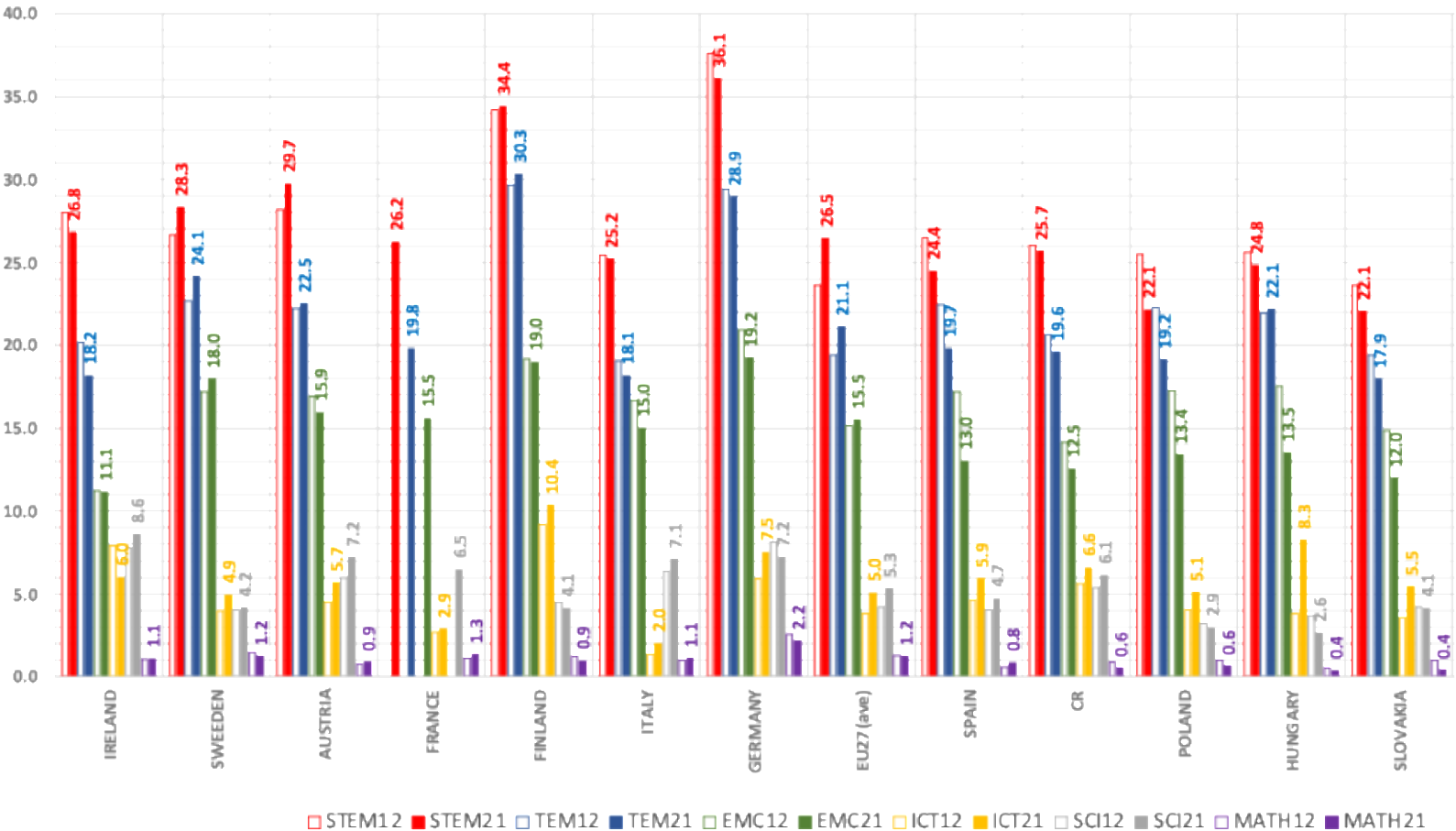
Building Future Ready Engineers

STEM statistics



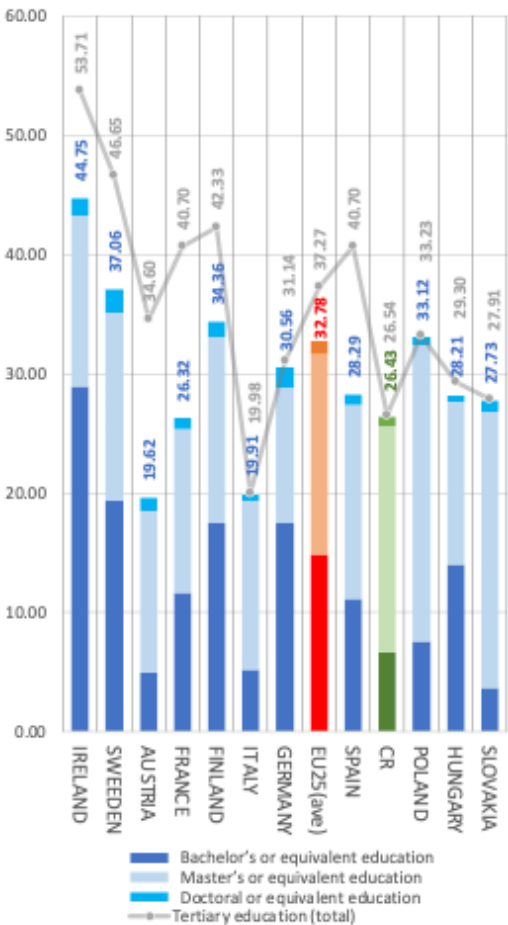
SCIENCE AND TECHNICAL HIGHER EDUCATION STUDIES 2012 vs. 2021 % OF TOTAL
STEM | TEM | EMC | ICT | SCI | MATH

SOURCE: OECD 2023

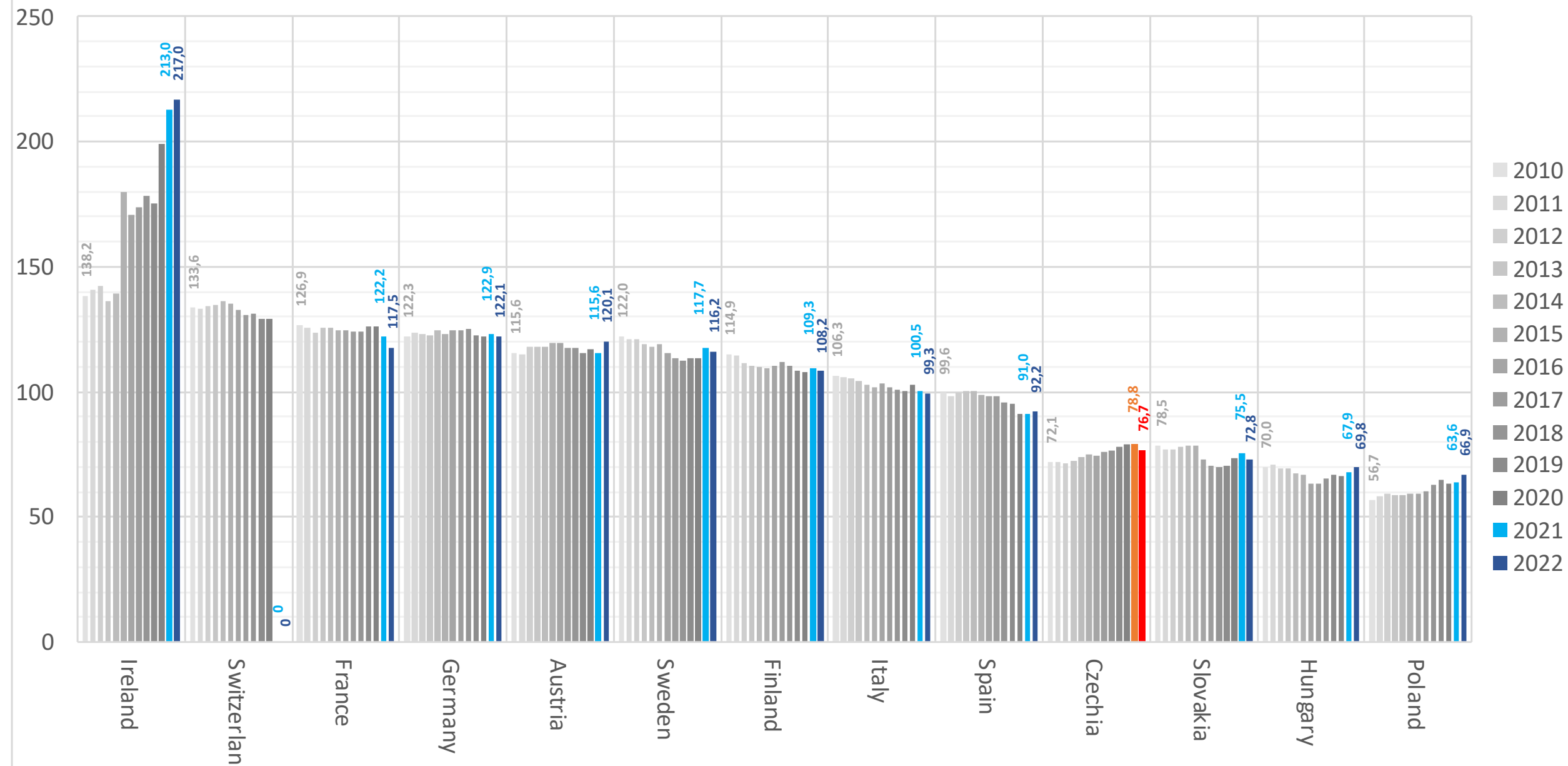


TERTIARY EDUCATION AS PERCENTAGE
OF OVERALL POPULATION 2021

ZDROJ: OECD Education at a Glance 2023

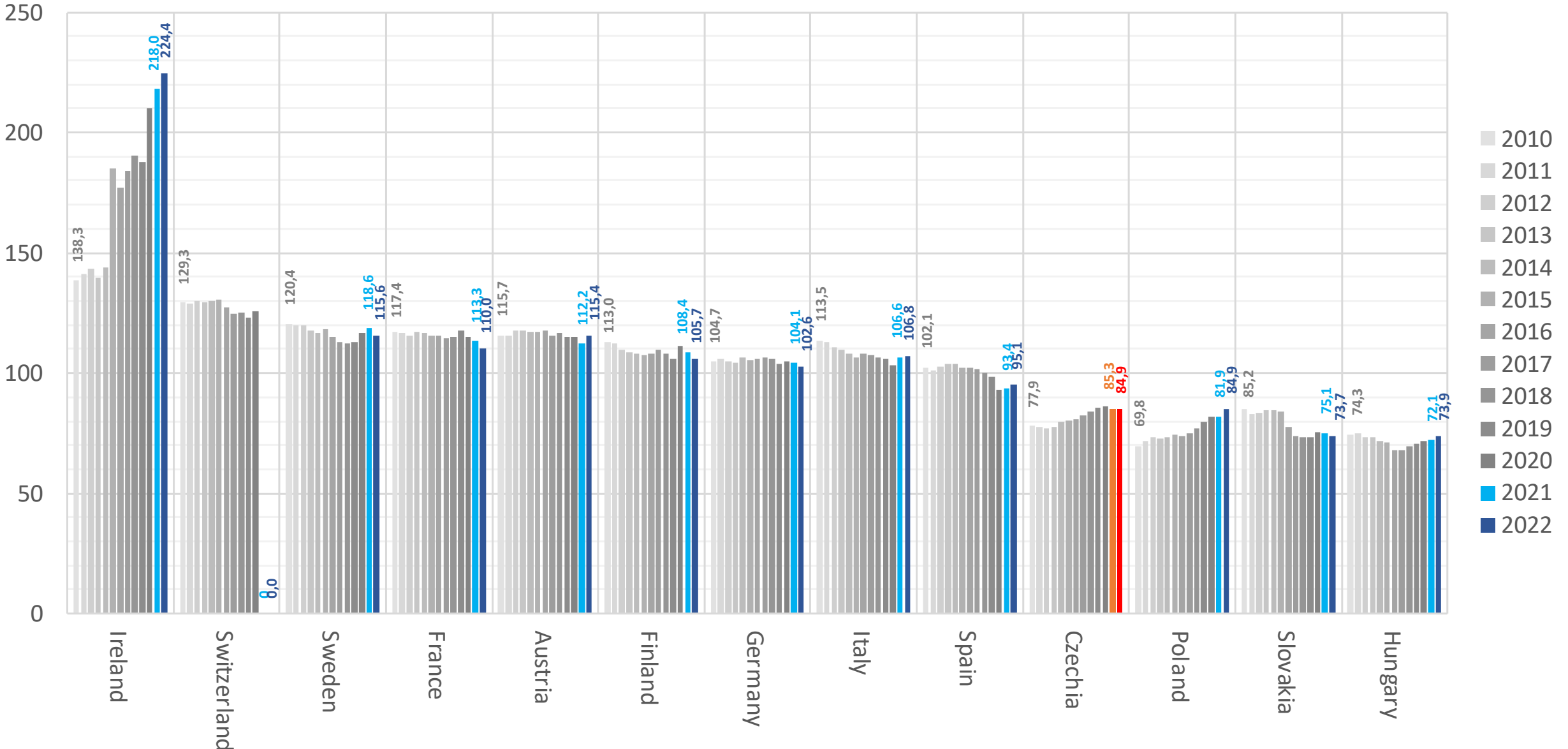


Nominal labour productivity per hour worked to EU27 average = 100%
2010-2022, source: Eurostat



Nominal labour productivity per person to EU27 average = 100%

2010-2022, source: Eurostat



Advancing STEM education & research

BUT STEM initiatives 2023 – 2025



2023

1st Czech National STEM round table – Multi-stakeholder discussion involving government, public-sector, university, and industry representatives

2024

2nd Czech National STEM round table – Multi-stakeholder discussion involving government, public-sector, university, and industry representatives

education conferences – keynote speeches, V4 & national conferences

- *the future of secondary education*
- *HR capacity for labour market (nuclear power, semiconductors,...)*
- *shaping STEM graduate profile for the 21st century*

CESAER Task Force Teaching & Learning

STEM initiative South Moravia – increase the number of STEM by 30 % by 2030

2 STEM education surveys – conducted both by BUT and the STEM initiative

- *STEM study preferences of elementary and secondary school pupils (approx. 7400 responses from pupils from primary and secondary schools in South Moravia Region)*
- **STEM Graduates' Employability and Skill Set in the Labour Market (shaping optimal STEM graduate)**

approx. 400 responses from companies across the Czech Republic

Advancing STEM education & research

BUT STEM initiatives 2023 – 2025



2025

EULiST European University Alliance – STEM as an Alliance red-line topic

National Semiconductor Centre – BUT as a lead partner of competence centre

contractual funding for technological qualifications – by the state & industry

myMachine initiative – connects primary pupils, secondary students, university students, and companies

CESAER Annual Meetings

- high level conference „**Shaping the future of STEM education: Advancing excellence through transnational cooperation**“
- workshop „**Research security as a collective responsibility: empowering universities, enabling Europe**“
- roundtable „**Governance and strategic vision of European Universities alliances**“
- exclusive leadership track „**Competitive by design: Leadership in STEM from lab to global impact**“

Strengthening talent pipelines in Europe

supporting talent circulation and competitiveness



Erasmus

European University Alliances – a distributed expertise

- chance to develop highly skilled and internationally minded graduates
- joint-degrees and microcredential-based courses of study
- transferable creditting
- accreditation and quality assurance – European Approach & feasibility?

International doctoral studies and PhD schools

postdocs sharing

Anchoring Innovation in Regional Ecosystem

driving innovation through industrial partnership & business development



industrial partnership – involvement in QA and needs analyses

industrial doctorates

contractual funding of education – shared by the state and employers

knowledge transfer and business development support

technology parks and business incubators – including venture capital
Brno Technology Park, Science & Technology Park, Czech Technology Park

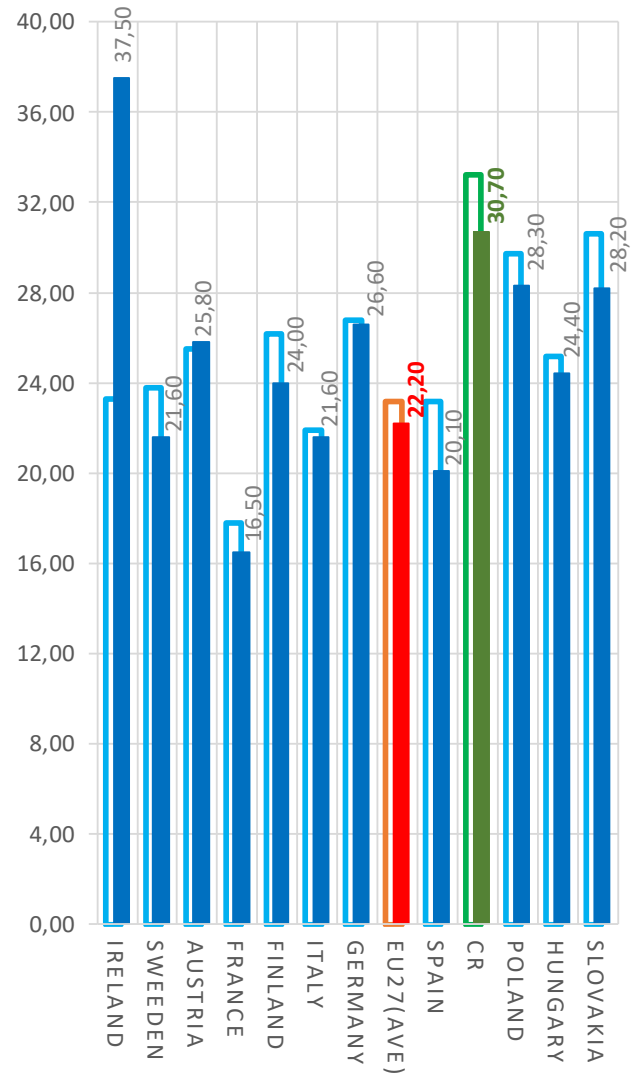
innovation agencies - South Moravian Innovation Centre

technological clusters – semiconductors, space, batteries, aeronautical, automotive, optical, ...

Thank you for your attention

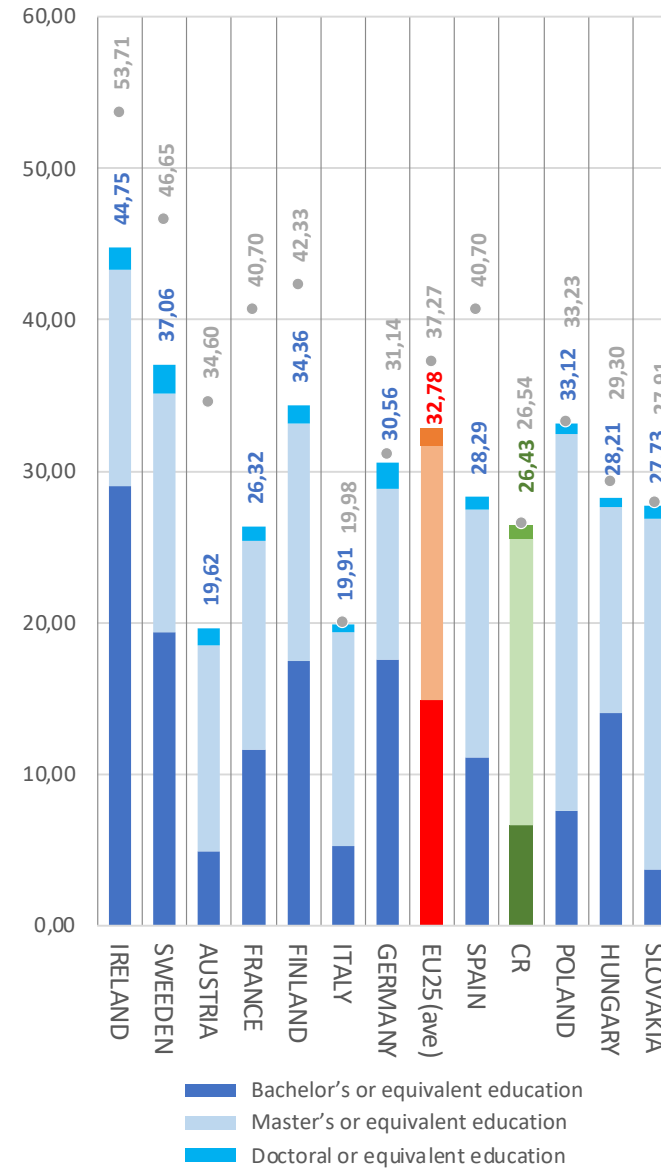
INDUSTRY SHARE AS PERCENTAGE OF GDP 2011 | 2021

ZDROJ: WB 2023

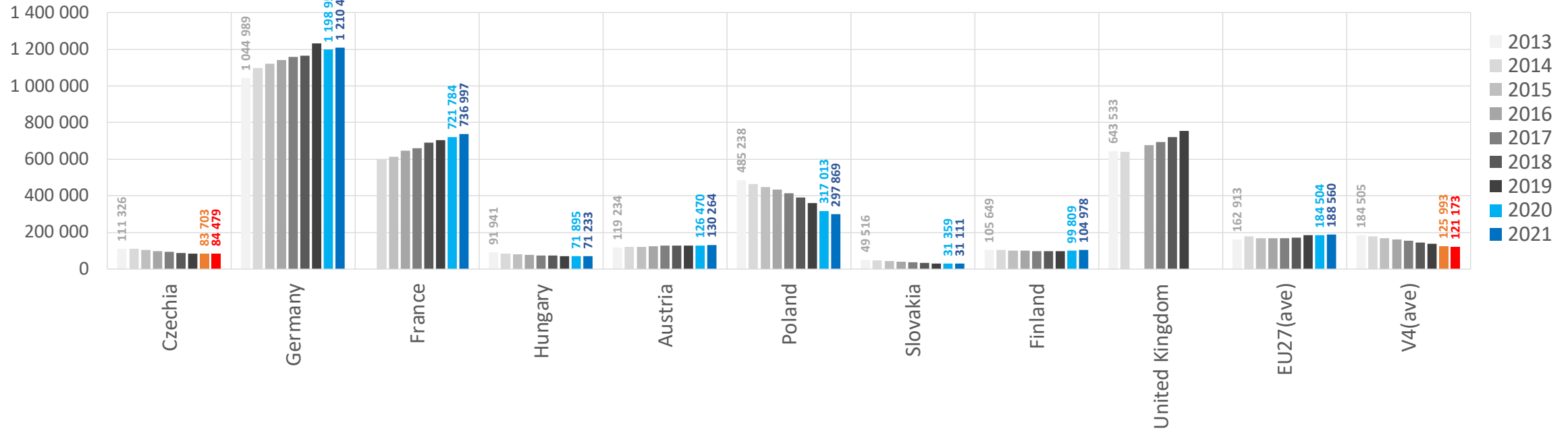


TERTIARY EDUCATION AS PERCENTAGE OF OVERALL POPULATION 2021

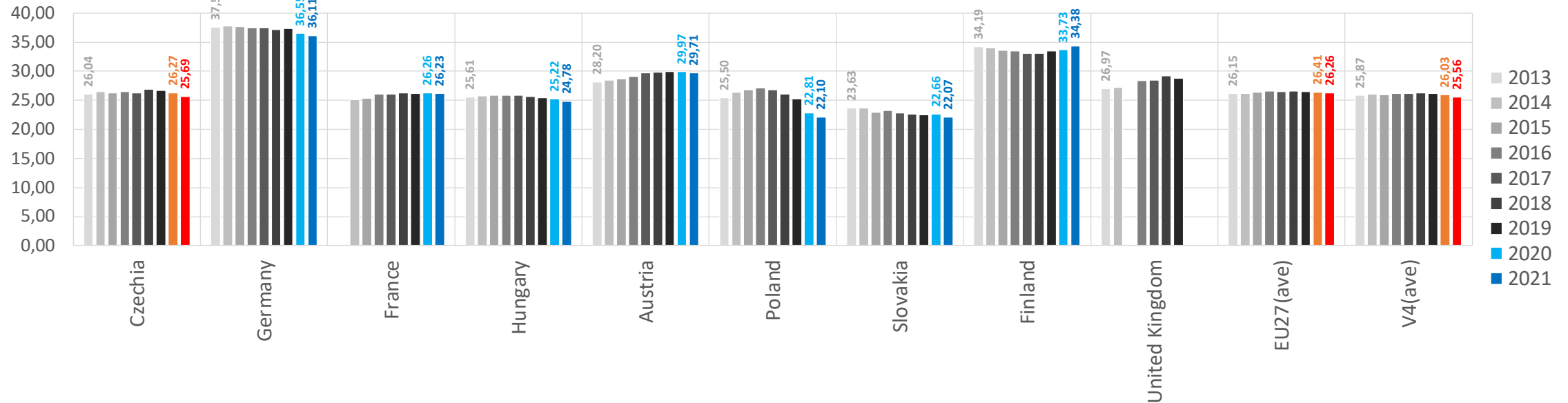
ZDROJ: OECD Education at a Glance 2023



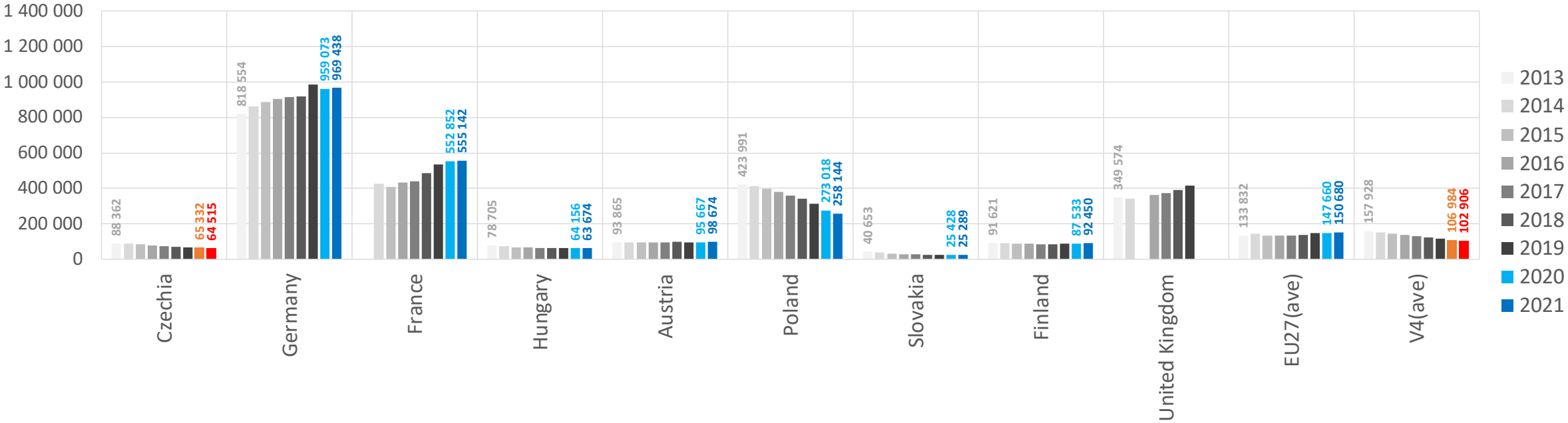
Students enrolled in **STEM** fields



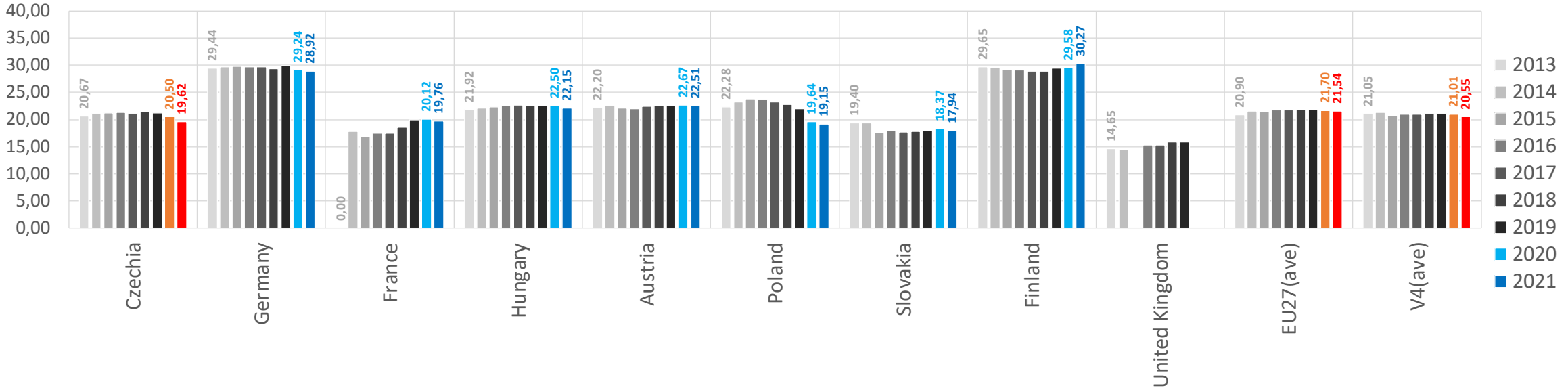
Percentage of students enrolled in **STEM** fields (100% = all students in tertiary education in the country)



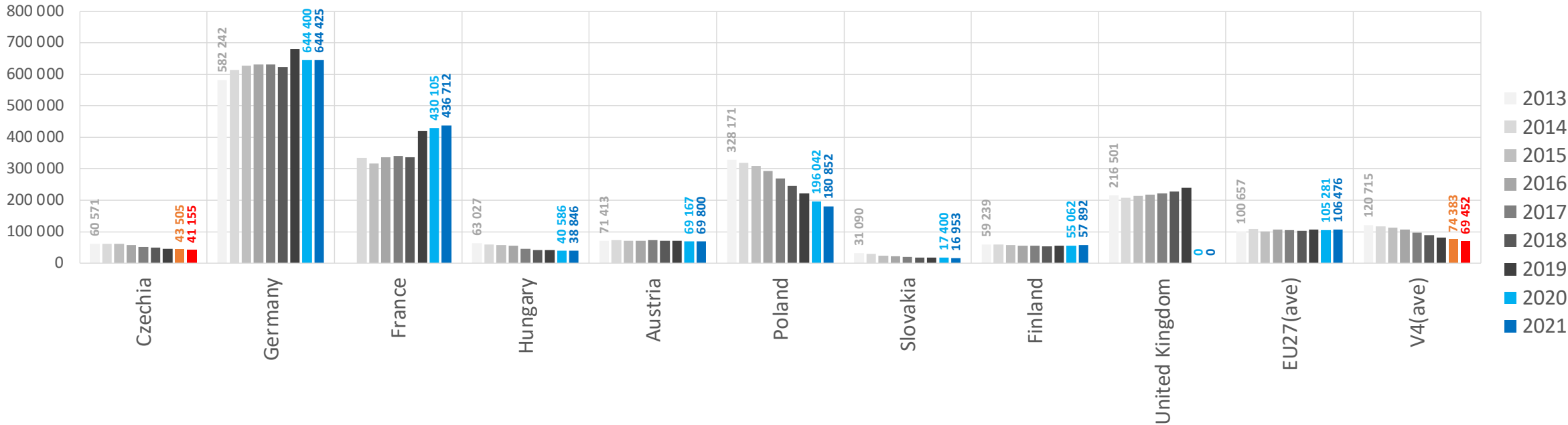
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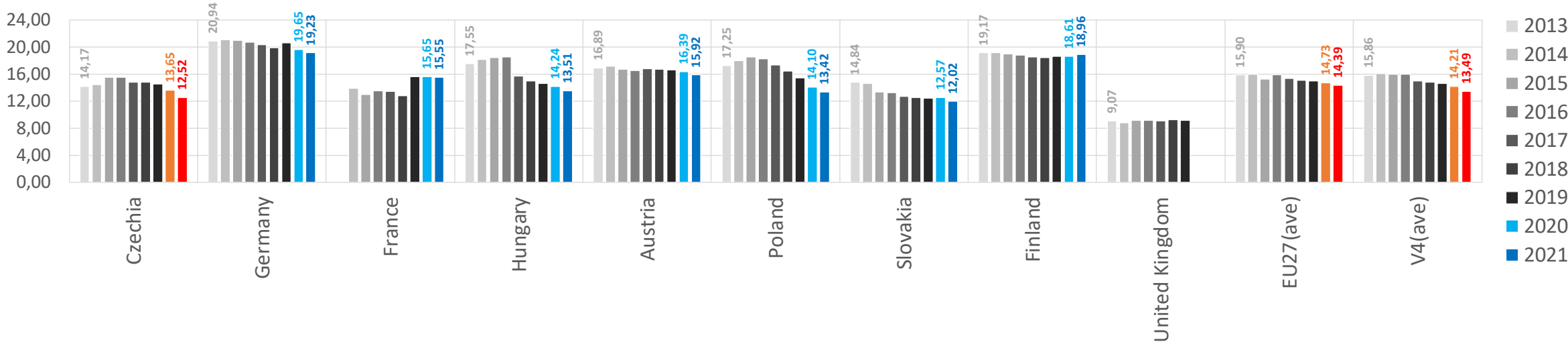
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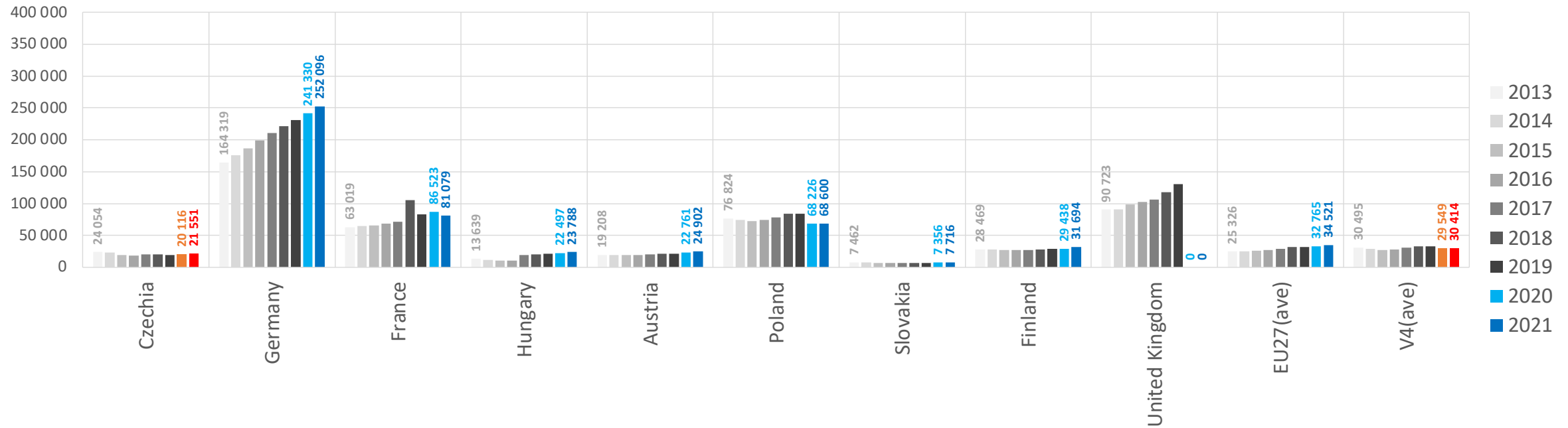
Students enrolled in **Engineering, Manufacturing and Construction**



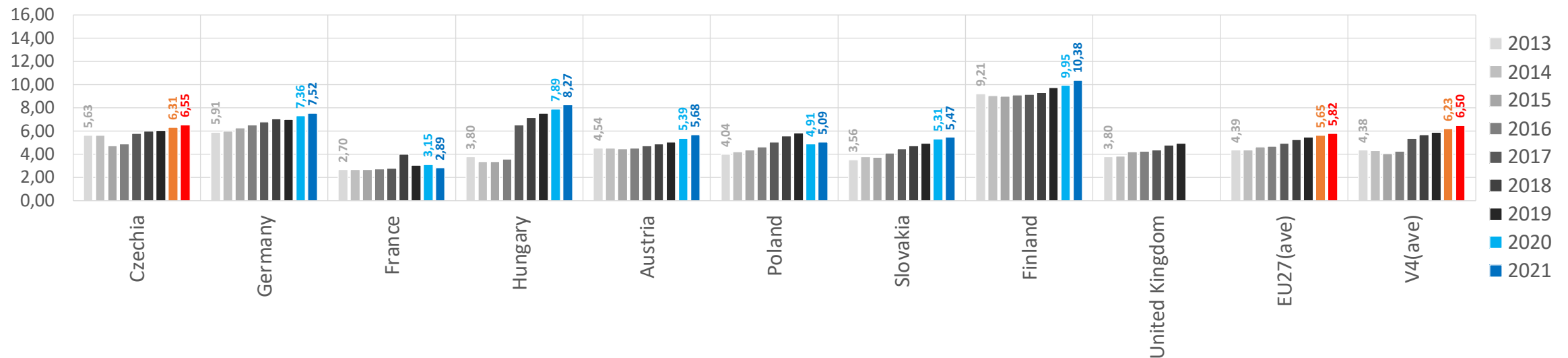
Percentage of students enrolled in **Engineering, Manufacturing and Construction**
(100% = all students in tertiary education in the country)



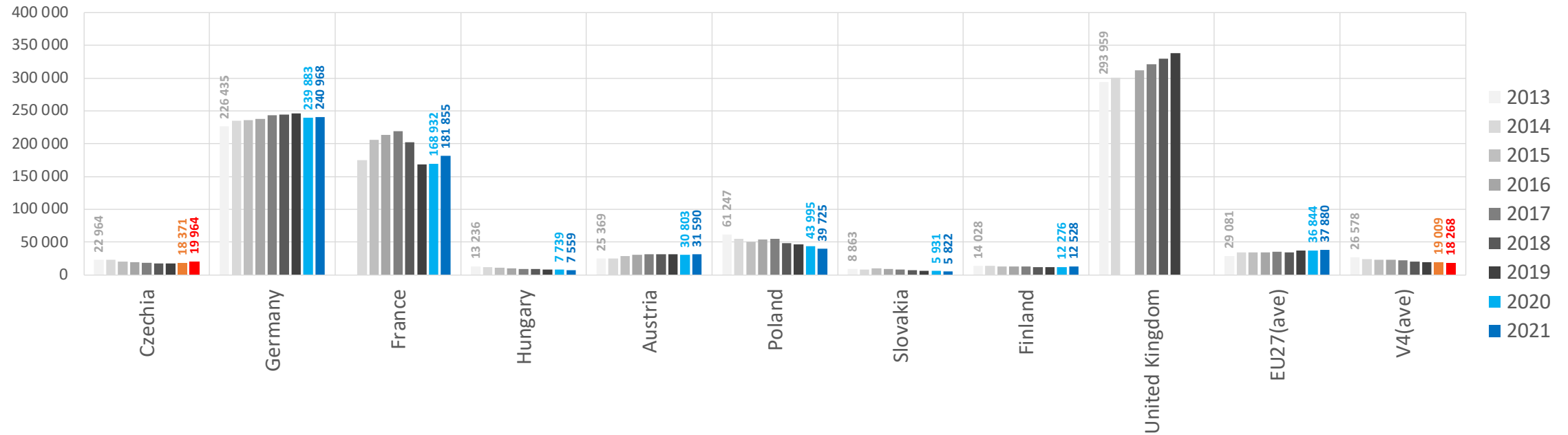
Students enrolled in Information and Communication Technologies



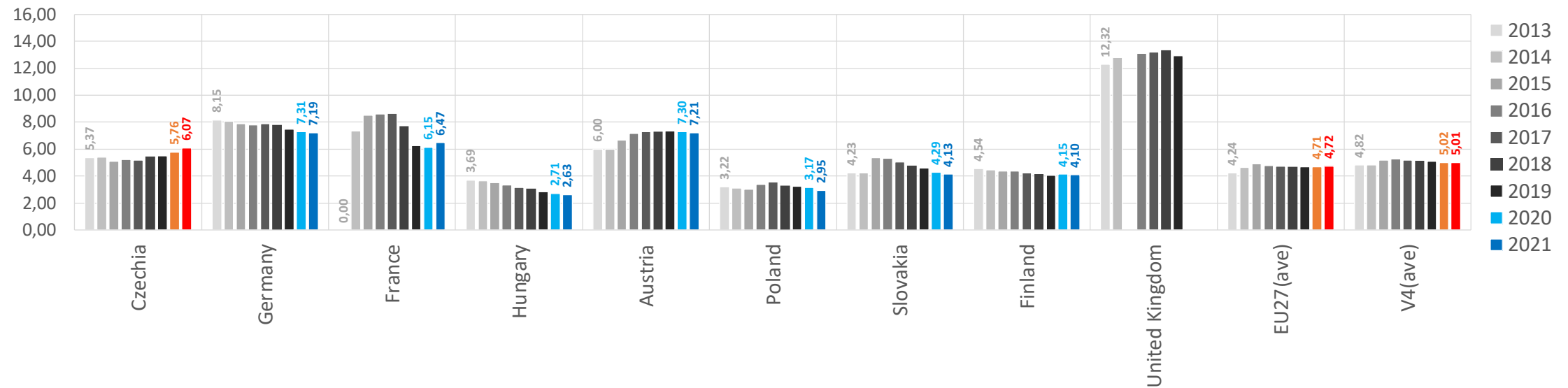
Percentage of students enrolled in Information and Communication Technologies (100% = all students in tertiary education in the country)



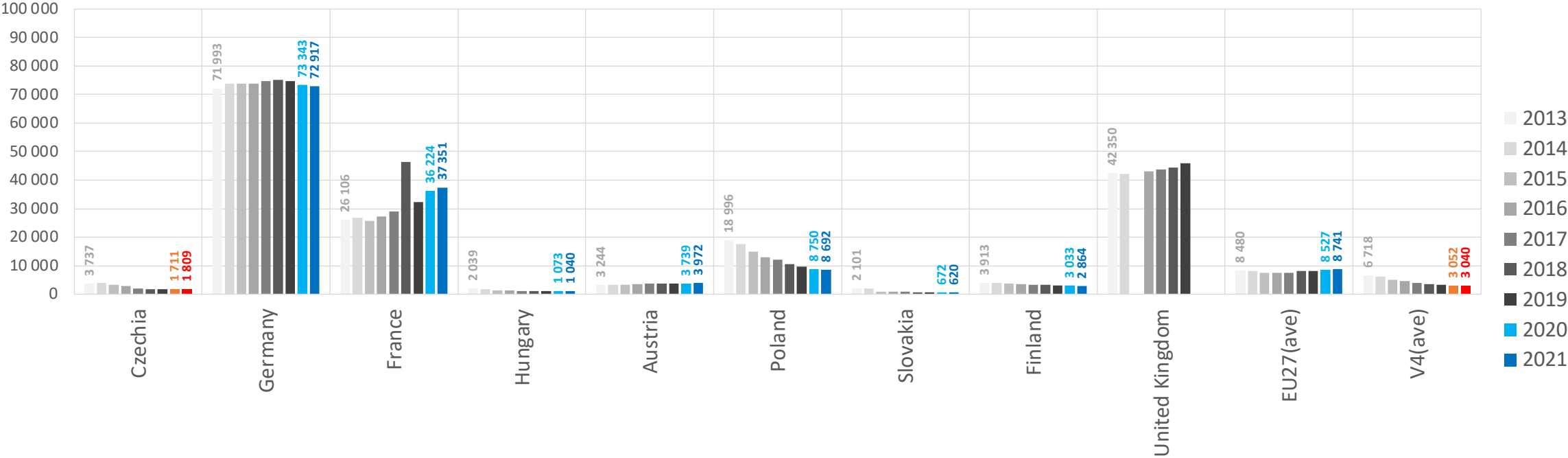
Students enrolled in Natural Sciences



Percentage of students enrolled in Natural Sciences (100% = all students in tertiary education in the country)



Students enrolled in **Mathematics & Statistics**



Percentage of students enrolled in **Mathematics and Statistics** (100% = all students in tertiary education in the country)

