



EUROPEAN CORPORATE COUNCIL ON AFRICA AND THE MIDDLE EAST

The background features several abstract, organic shapes in muted colors: a light green shape in the top right, a light blue shape in the bottom left, and a light orange shape in the bottom right. Thin, curved lines in corresponding colors (orange, green, blue) are scattered across the white background.

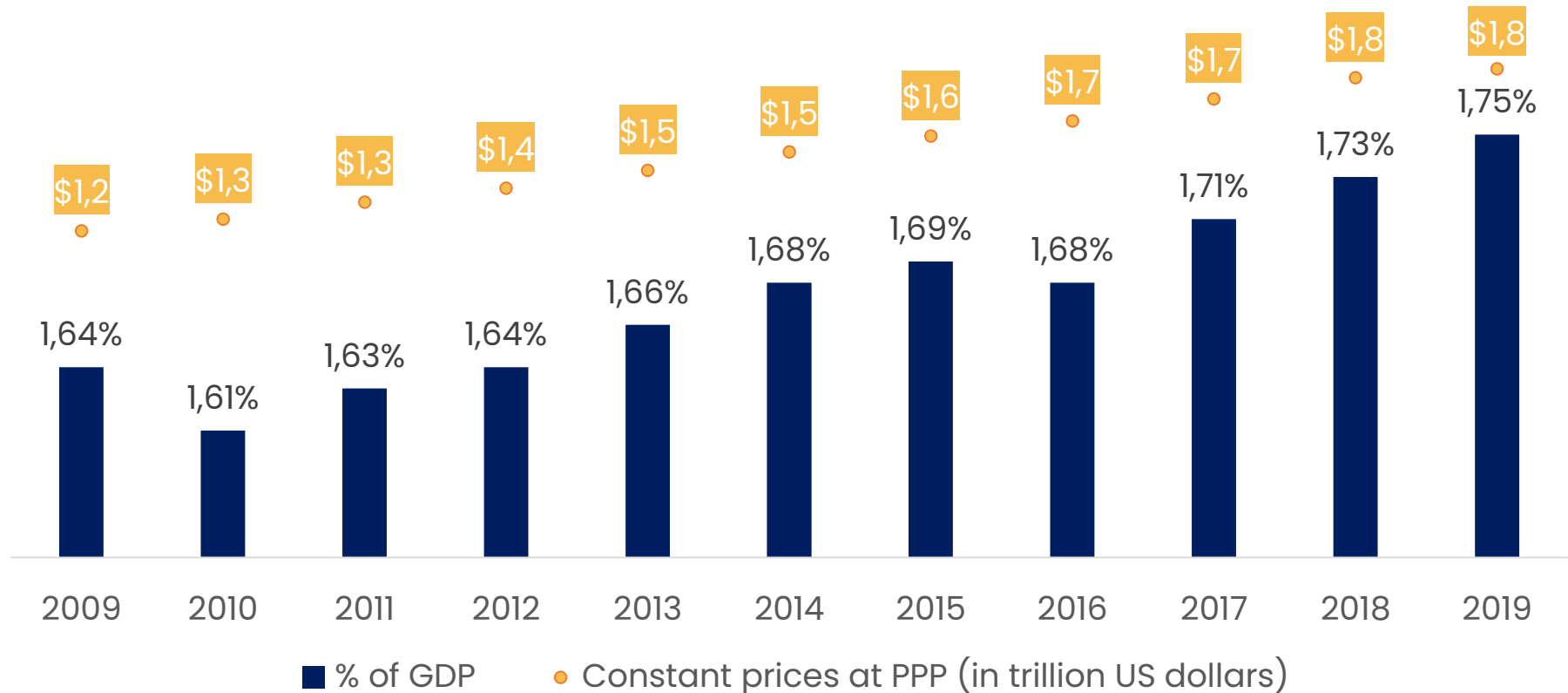
Research, Education and
the **Medicine of the Future**

Key messages

- **R&D and knowledge** are growing at global level in terms of inputs (R&D investments), outputs and outcomes
- **Innovation is crucial for economic growth** and is driving performance of both countries and companies
- **The Life Sciences industry** is a leader in R&D and innovation capacity providing major benefits for patients and societies and enabling what is called the Medicine of the Future
- **Cooperation and education** will be even more important **in allowing** countries to benefit from Life Sciences innovations and Medicine of the Future developments

R&D investments are steadily rising at global level reaching a record value of \$1.8 trillion in 2019...

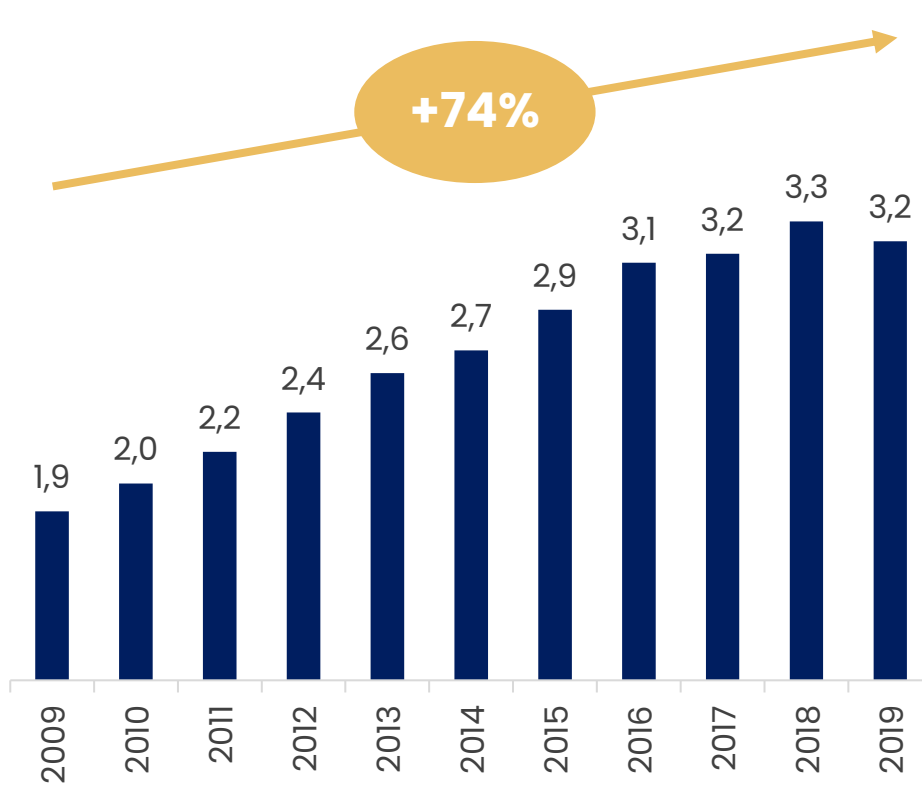
Gross Domestic Expenditure intensity (R&D expenditures as % of GDP) and value (\$trillion) at global level, 2009–2019



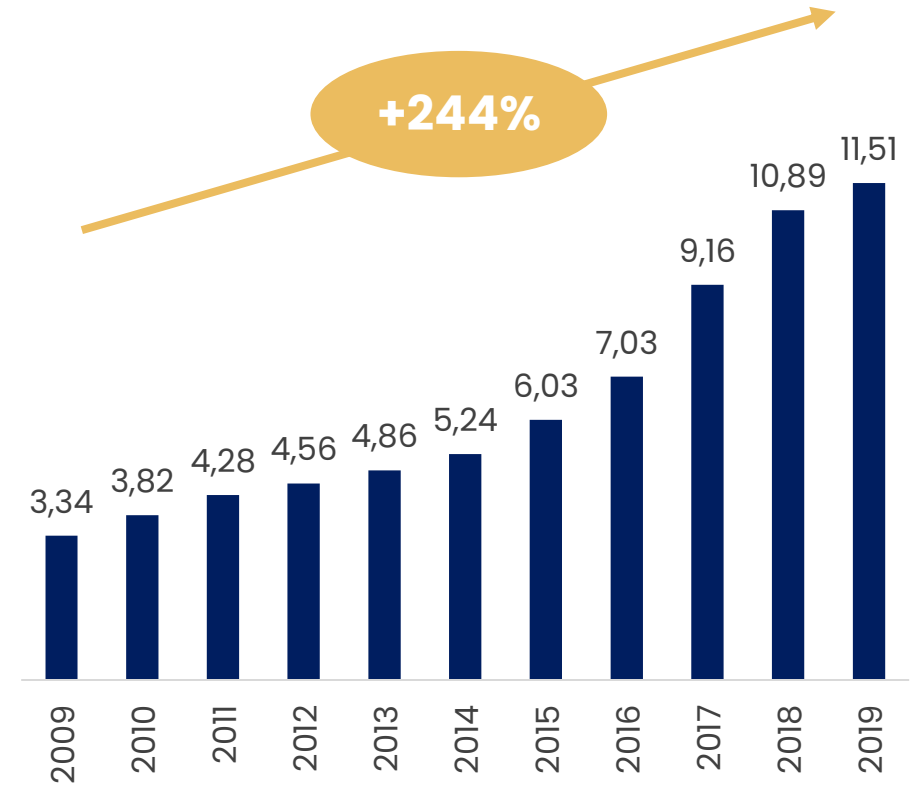
Source: The European House – Ambrosetti on UNESCO data, 2021.

... research and innovation outputs are also growing both in terms of patents and trademark applications

Total patent applications globally,
(million patents and % growth) 2009-2019



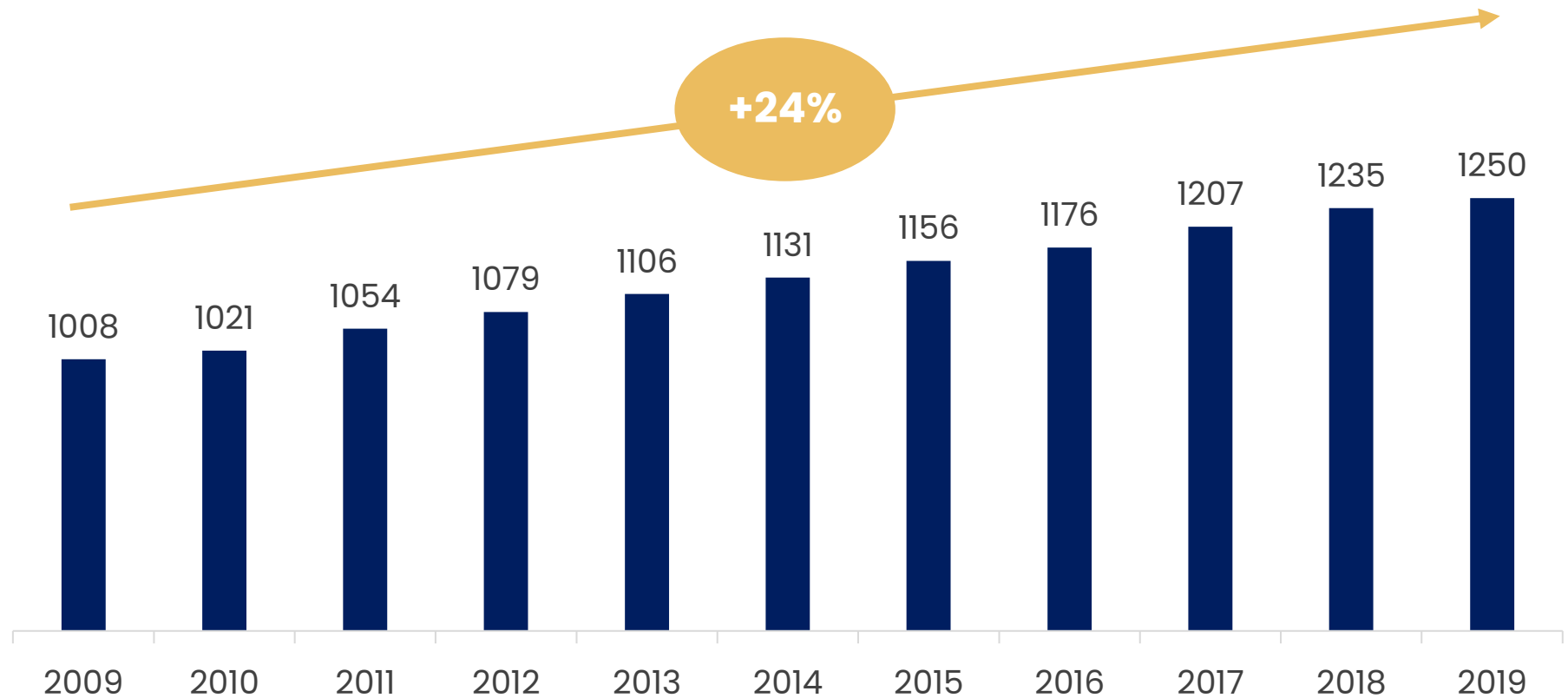
Total trademark applications globally,
(million trademarks and % growth) 2009-2019



Source: The European House – Ambrosetti on World Intellectual Property Organization data, 2021.

At the same time, the number of researchers is rising both in absolute and relative terms

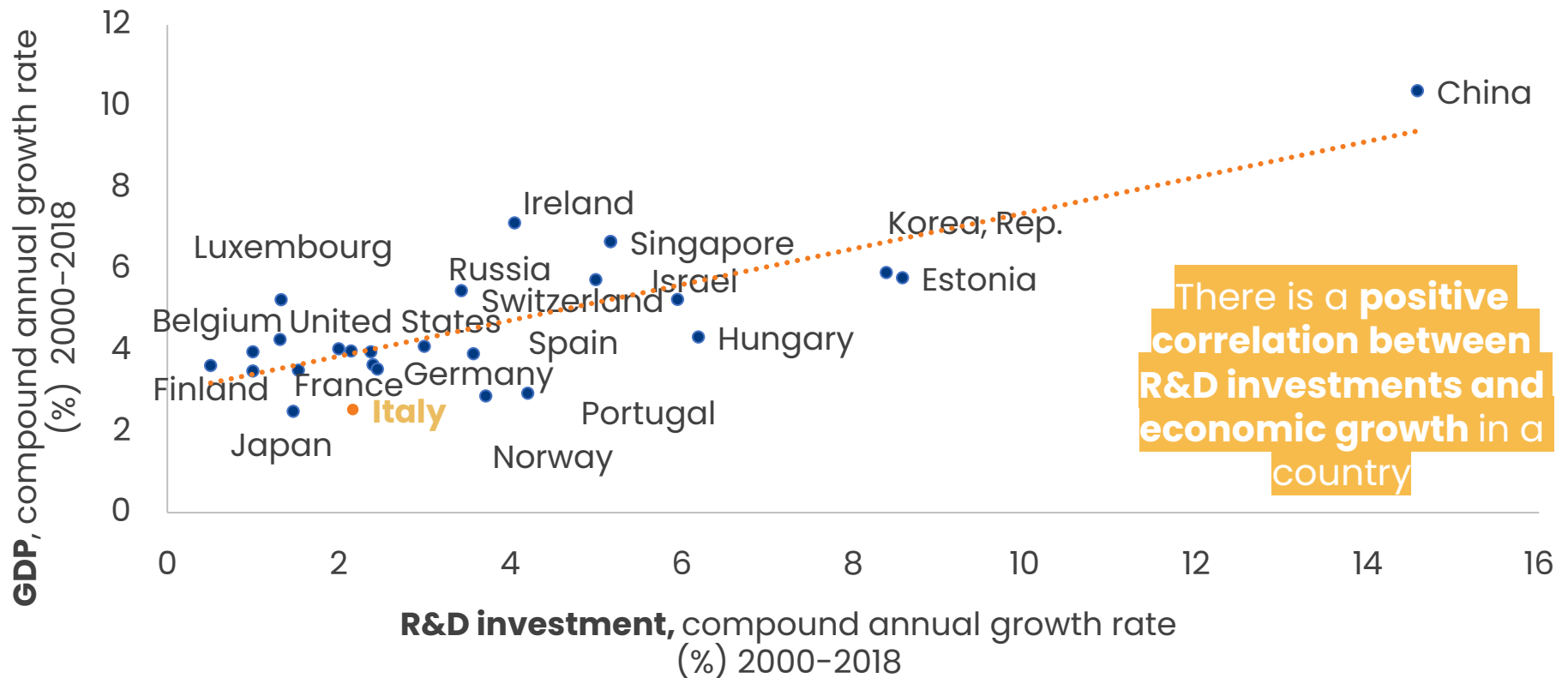
Researcher intensity at global level
(number of researchers per million inhabitants) 2009–2019



Source: The European House – Ambrosetti on [UNESCO](#) data, 2021.

The Covid-19 emergency stressed the strategic importance of investing in R&D to drive economic growth

Relationship between R&D investments and GDP growth in 28 world economies, 2000-2018

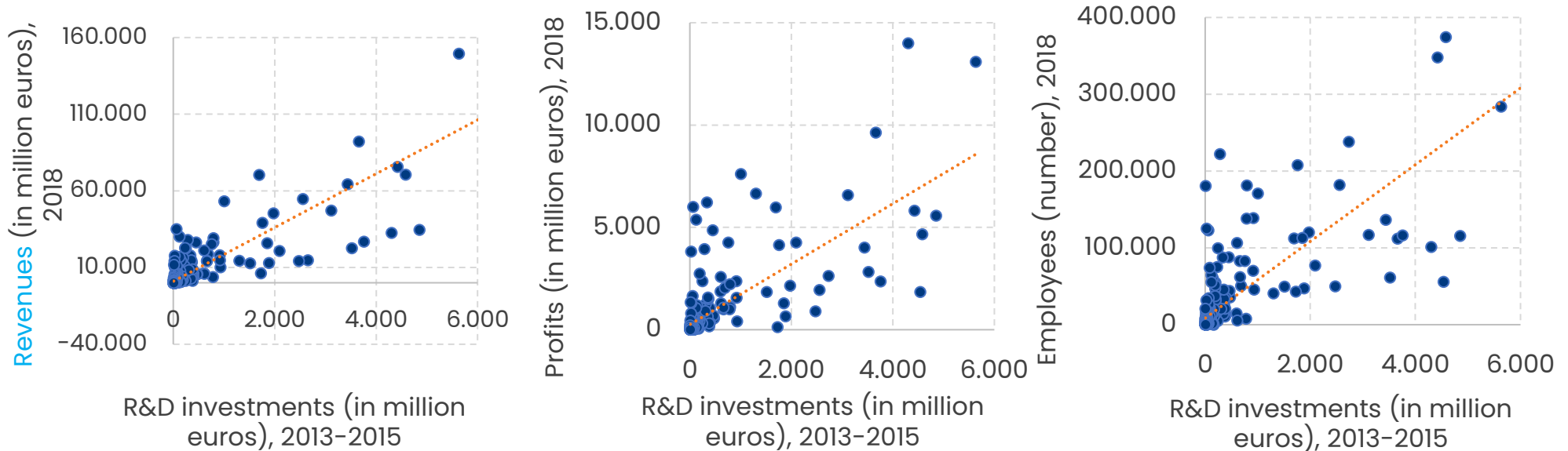


There is a **positive correlation between R&D investments and economic growth in a country**

Source: The European House – Ambrosetti on World Bank and OECD data, 2021.

At the same time, it is strategic for companies to invest in innovation to augment their overall performance...

Relationship between R&D investments and company performance in the manufacturing sector of the 1,000 Top R&D Spenders in Europe, 2000–2018



There is a positive and **significant relationship between R&D investments and company performance**

Source: The European House – Ambrosetti on World Bank and OECD data, 2021.

Without science and research and development there is no future ahead of us

NO RESEARCH AND DEVELOPMENT → NO SCIENCE

NO SCIENCE → NO VISION

NO VISION → **NO FUTURE**



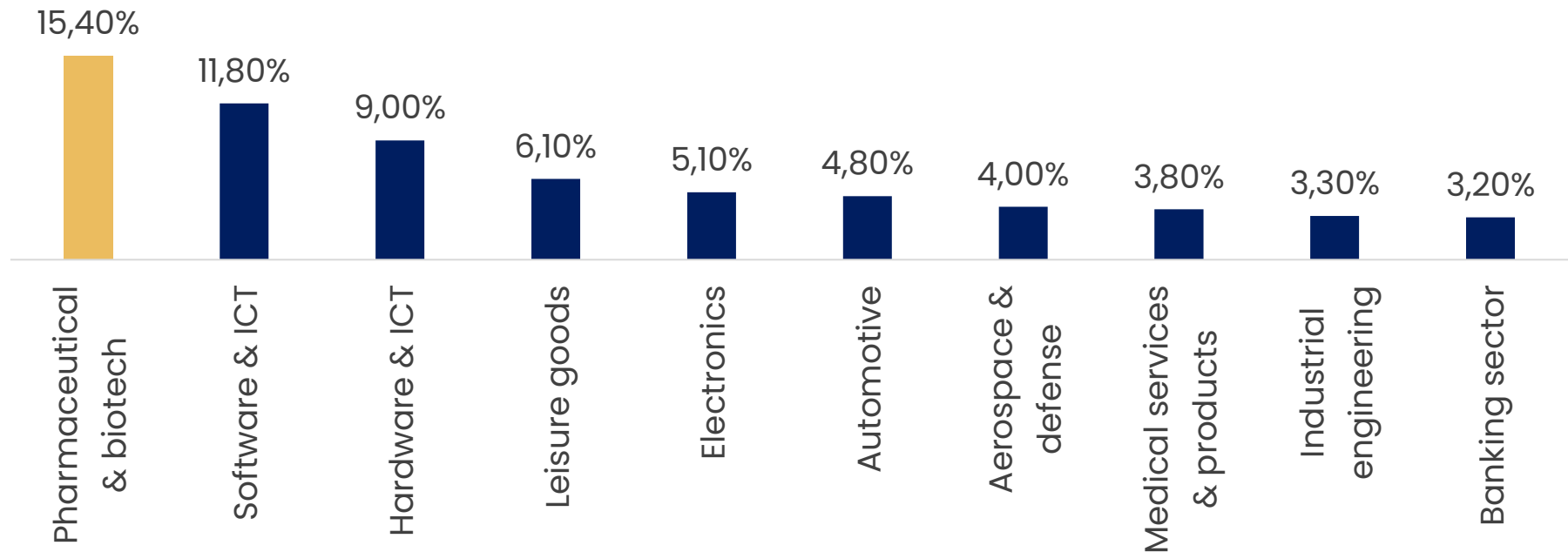
NO INVESTMENTS → NO JOBS

NO JOBS → NO GROWTH

NO GROWTH → **NO FUTURE**

Life Sciences is the world's leading industry sector in terms of intensity of R&D investments ...

Top-10 industry sectors for R&D intensity*
(%), 2019

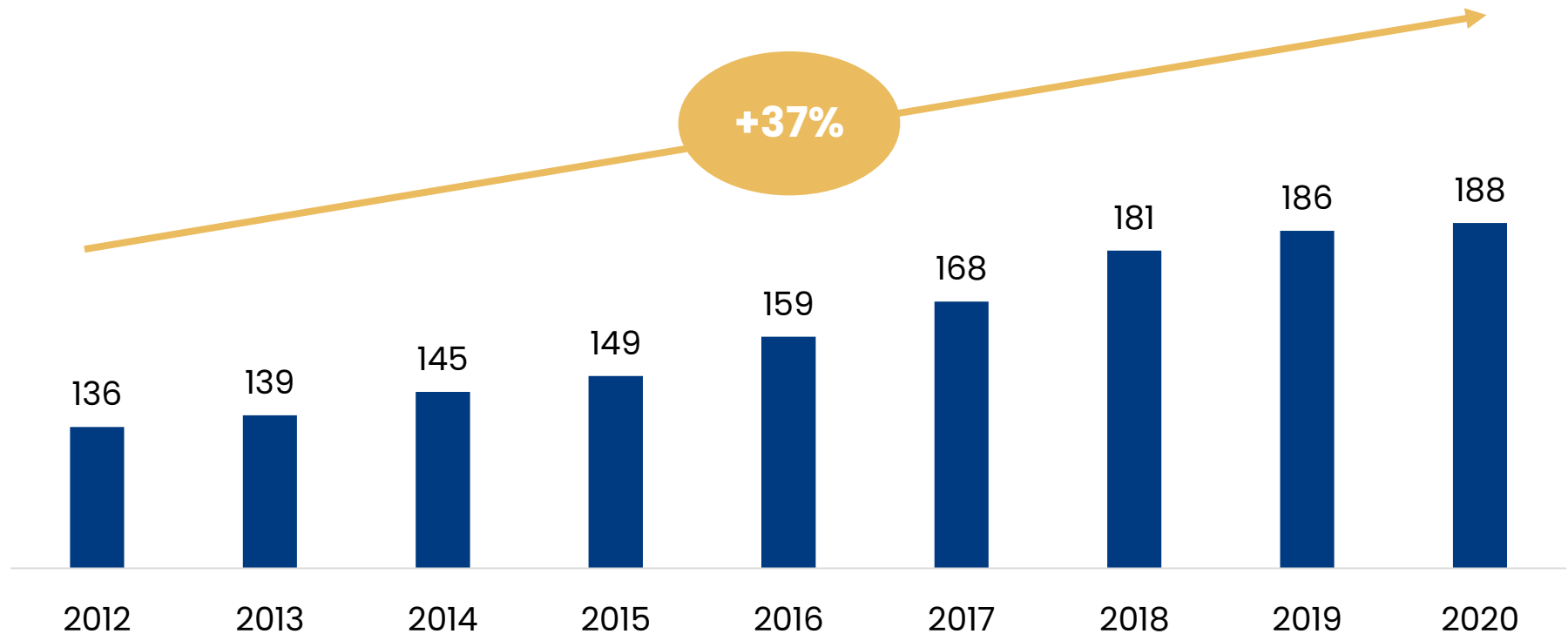


Source: The European House – Ambrosetti on European Commission data, 2021.

*Calculated as a percentage of R&D investments on net sales.

... it reached a record value of \$186 billion invested in R&D in 2019

R&D investments in biotech and pharmaceutical sectors globally
(in billion US dollars), 2012-2020



Source: The European House – Ambrosetti on European Commission data, 2021.

*Calculated as a percentage of R&D investments on net sales.

Continuous innovation in the Life Sciences effort opens the way to unprecedented developments in healthcare ...

DIGITAL HEALTH



- **Contact tracing, testing, and surveillance** augmented by data-driven technologies
- **Telemedicine** and ad-hoc apps

+22% investments from Q1-Q2 2020, reaching **\$5.8 billion** (2nd highest value)

ARTIFICIAL INTELLIGENCE



- AI can support **diagnosis, research, precision medicine, clinical trials** and **patient-engagement** because it is complemented by Big Data
- **+42%** of published papers on AI and medicine in 2020 vs 2019 (6,657 total)

+14% investments from Q1-Q2 2020, reaching **\$1.1 billion** (3rd highest value)

MEDICAL DEVICES & IoMT



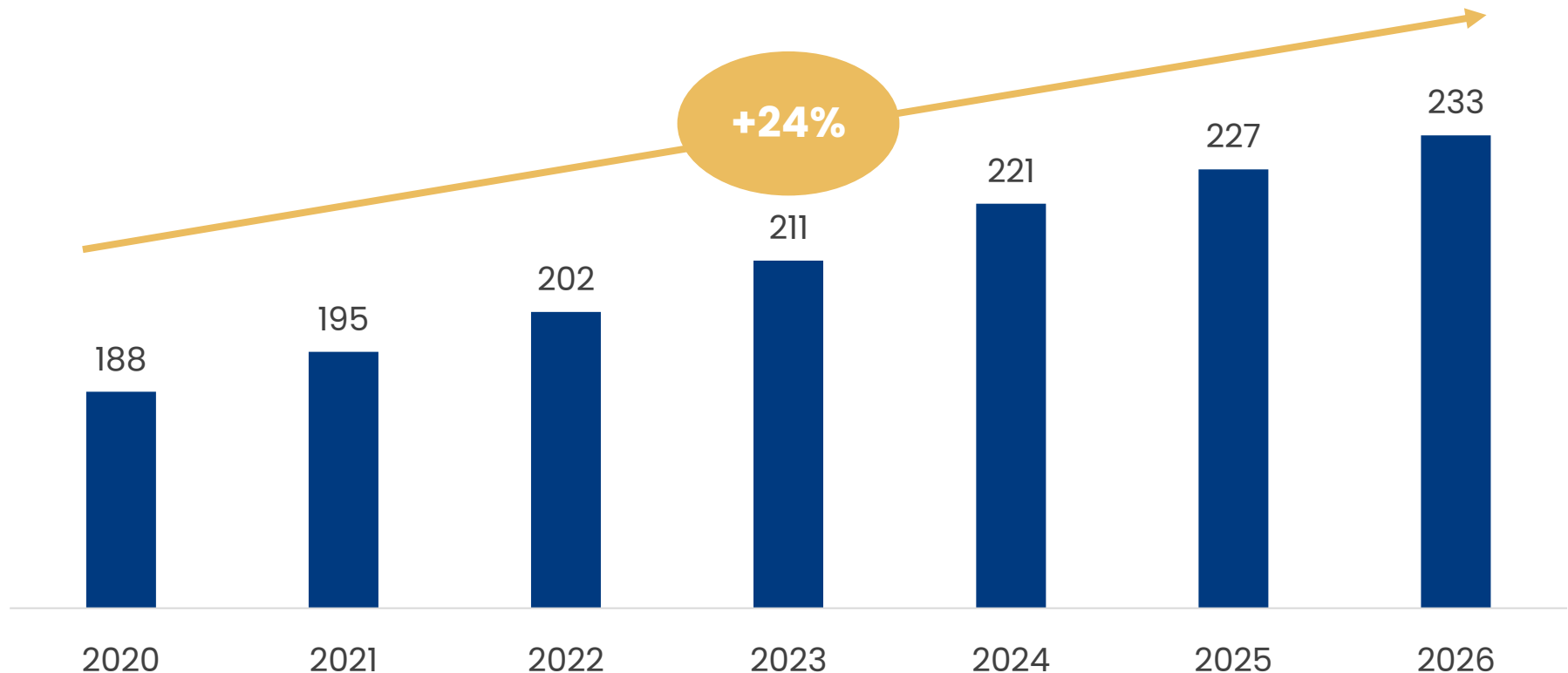
- Internet of Medical Things includes **wearable devices** to monitor health data and vital signs and **“smart” beds** in hospitals supporting treatment of patients and providing useful insights to researchers

+41% investments from Q1-Q2 2020, reaching all time highest value of **\$4.3 billion**

Source: The European House – Ambrosetti on Scopus data, 2021.

... driving further growth in investments in R&D in the next few years ...

Expected R&D investments in biotech and pharmaceutical sectors globally (\$bln), 2020-2026 estimates



Source: The European House – Ambrosetti on European Commission data, 2021.

*Calculated as a percentage of R&D investments on net sales.

... and fostering the so-called **Medicine of the Future** paradigm towards new frontiers

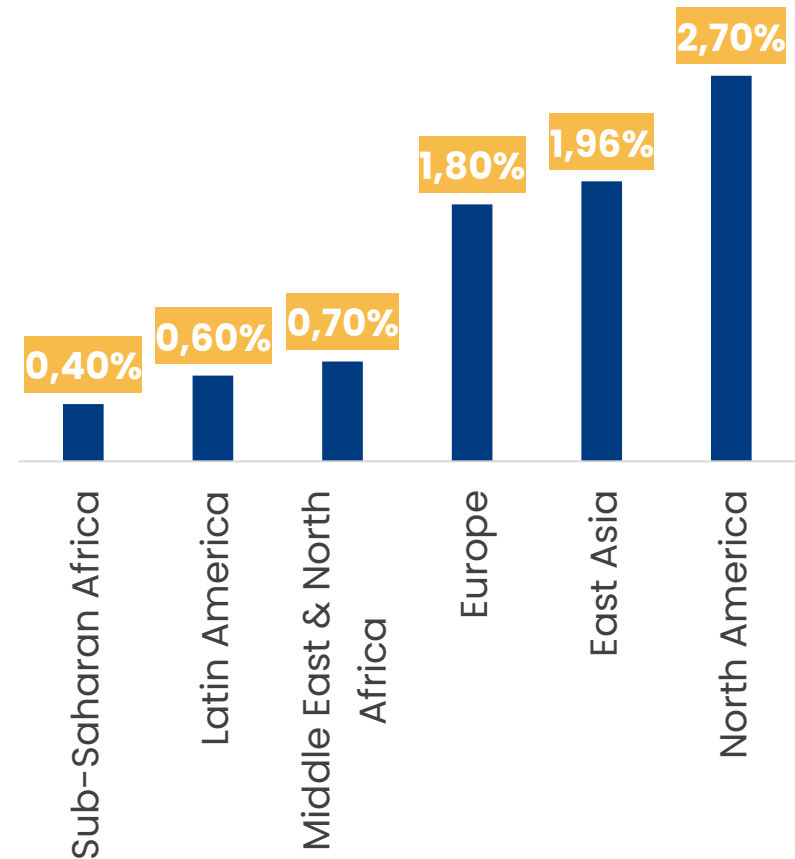
Among others, **MEDICINE OF THE FUTURE** innovations include:

- **Biofoundries**, i.e., infrastructure that integrates synthetic biology and automation engineering processes, allowing for an acceleration in the production process, e.g., automated diagnostic tests
- The analysis of **Real World Data** (RWD) that can be collected, analyzed and shared in real time represents a real paradigm shift for both research by improving R&D and business for cost-efficiency
- **RNA interference** (RNAi) which may enable a new therapeutic approach against new viruses by “silencing” genes of viruses to prevent replication and infection
- **CRISPR/Cas9-based genetic modification** which can be programmed to make specific changes to the genome of any cell, opening the way to new possibilities in genomic engineering
- **Quantum Computing** applied to Life Sciences, whose computational capacity will accelerate all activities, including data collection and elaboration of complex models on molecule interaction

To have a real impact, such innovations must benefit all countries and healthcare systems ...

- Investments in R&D are **unequal** among regions, with **Sub-Saharan Africa and the Middle East showing just 0.4% and 0.7% of GDP, respectively, for research**
- This **imbalance** also leads to the inability to adopt healthcare innovations; e.g., use of rapid diagnostic blood tests to detect malaria is limited in rural African communities due to its risky and complex diagnostic procedure
- African and Middle Eastern countries should not limit themselves to implementing innovations developed abroad, but will have to play a **leading role in R&D addressing sensitive problems for their local communities**

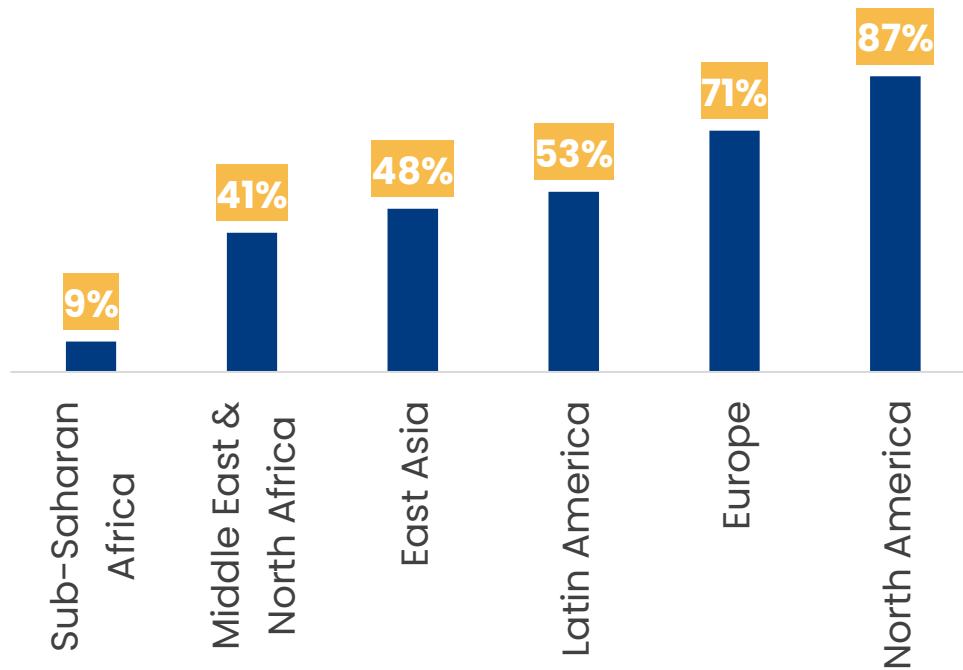
R&D investments in world regions
(% of GDP), average 2008–2018



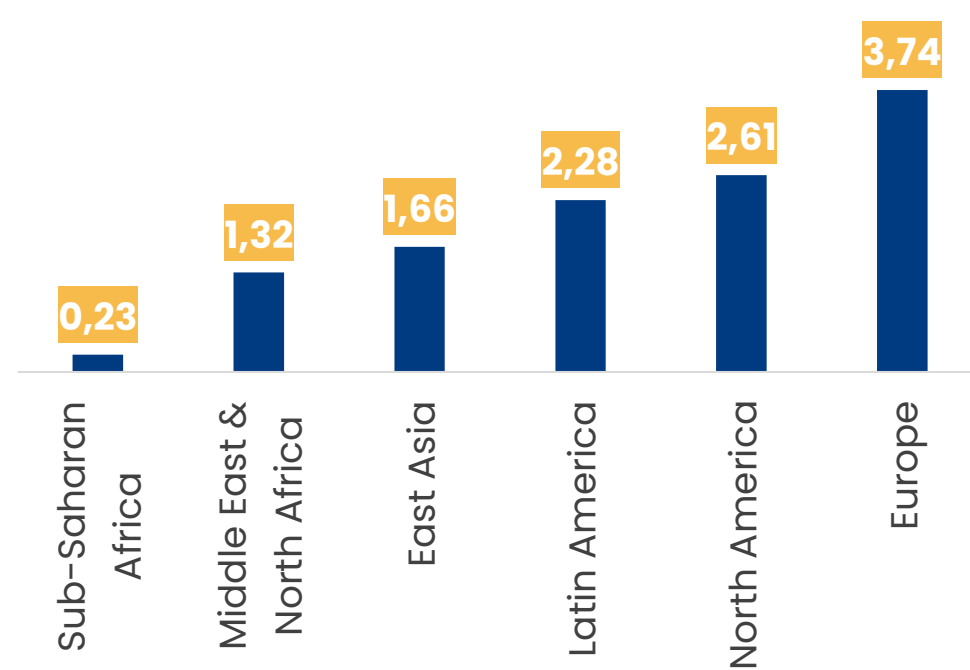
Source: The European House – Ambrosetti on UNESCO data, 2018.

... to reach this goal, education at all levels and international cooperation will be crucial

Tertiary school enrolment in world regions
(% of relevant age group), 2019



Number of physicians in world regions
(number per 1,000 people), 2019 or latest data available



Source: The European House – Ambrosetti on [UNESCO](#) data, 2018.



VIA SENATO 12
20121 MILANO (ITALY)
T. +39 02 8935 4826

WWW.ECAMCOUNCIL.COM