

Welcome to the presentation of

World Robotics 2022



For you on the panel



Marina Bill
IFR President

Global Head Marketing & Sales, ABB Robotics

Dr. Christopher Müller
Director Statistical Dpt.

International Federation of Robotics

Dr. Werner Kraus
Chair IFR Service Robot Group

Head of Dpt. Robot & Assistive Systems,
Fraunhofer IPA

Dr. Susanne Bieller
General Secretary

International Federation of Robotics

International Federation of Robotics

Who we are



- Professional non-profit organization
- Established in 1987
- Communication and networking platform
- About 90 members
 - National robotics associations, R&D institutes, robot suppliers, integrators
- Over 2000 organizations represented indirectly

Our members

NATIONAL ASSOCIATIONS



INDUSTRIAL ROBOT MANUFACTURERS



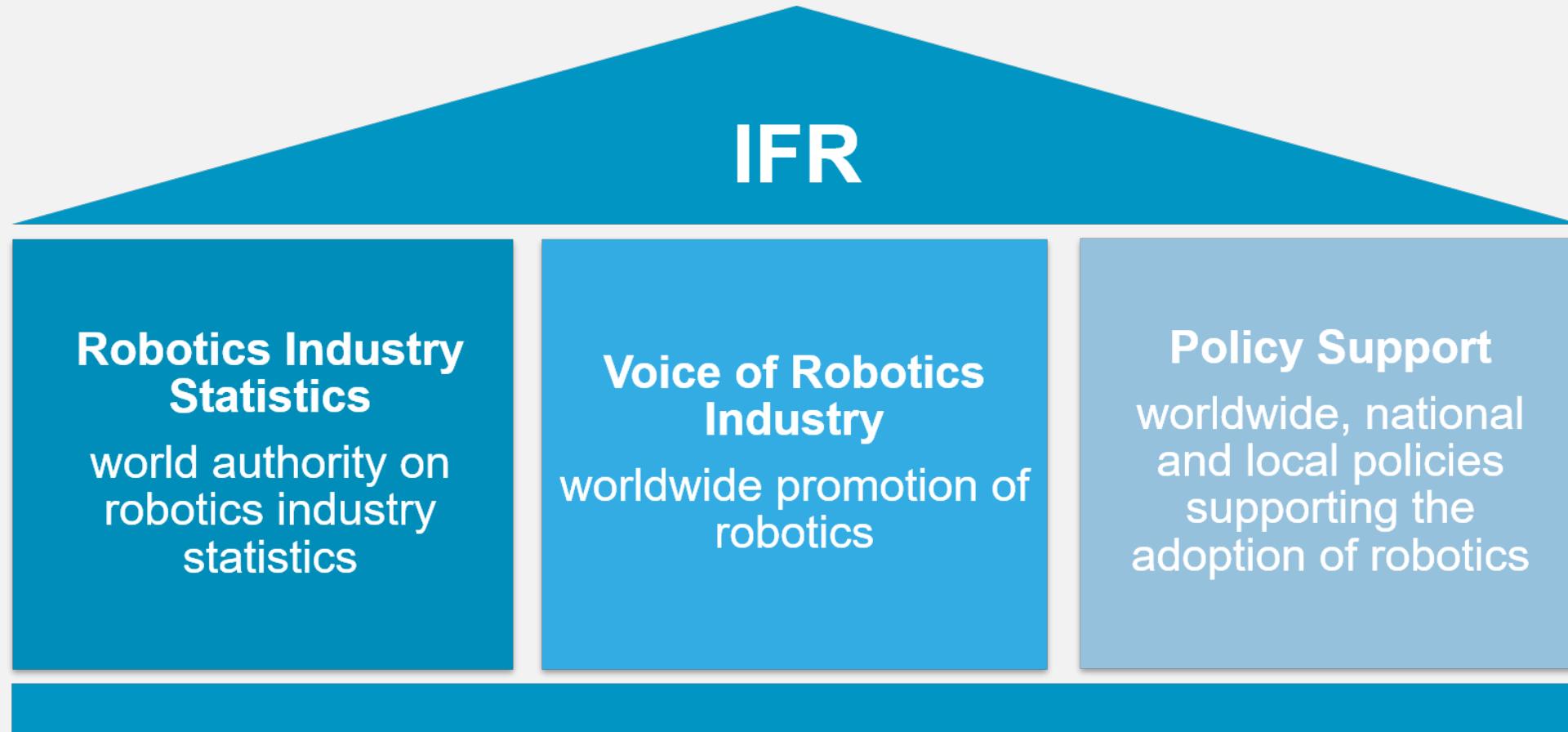
COMPONENT SUPPLIERS, INTEGRATORS, SERVICE ROBOT MANUFACTURERS



R&D INSTITUTES



Three pillars of IFR activities



What is a robot – and what is not?



Image: Photoneo

- “Robot” defined by **International Standards Organization ISO**
- **No robots:**
 - ✖ software (“bots”, AI, Robotic Process Automation -RPA)
 - ✖ remote-controlled drones, UAV, UGV, UUV
 - ✖ voice assistants
 - ✖ autonomous cars
 - ✖ ATMs, smart washing machines, etc.

Two types of robots

Industrial robots



Image: Dürr

Service robots

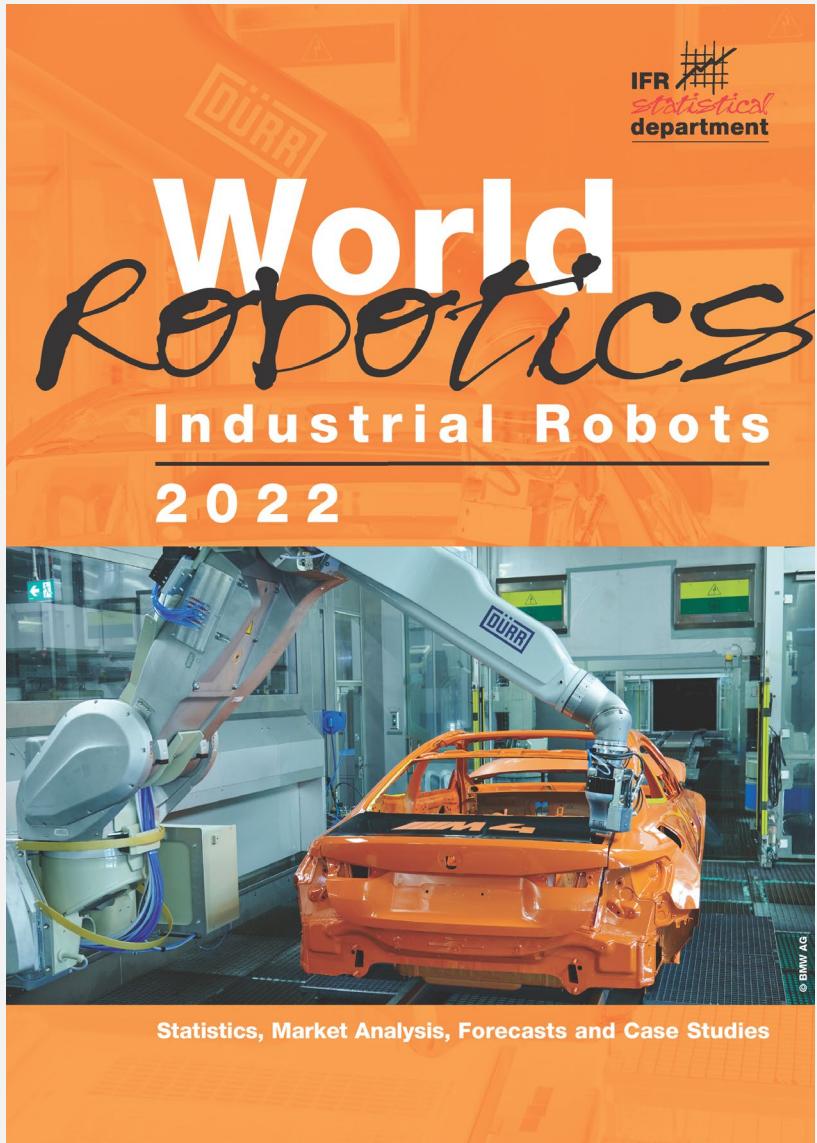


Image: Fourier Intelligence

Presentation of World Robotics 2022



Industrial robots - top findings



2021: Robot installations hit new record level

“The automation booster ignited”

Strong recovery from the pandemic year

New robots

- 517,000 units (+31%)
- highest number in history
- CAGR 2016-2021: +11%

Robot stock

- 3.5 million units (+15%)
- CAGR 2016-2021: +14%

Half a million limit broken in 2021

Annual installations of industrial robots - World

1,000 units

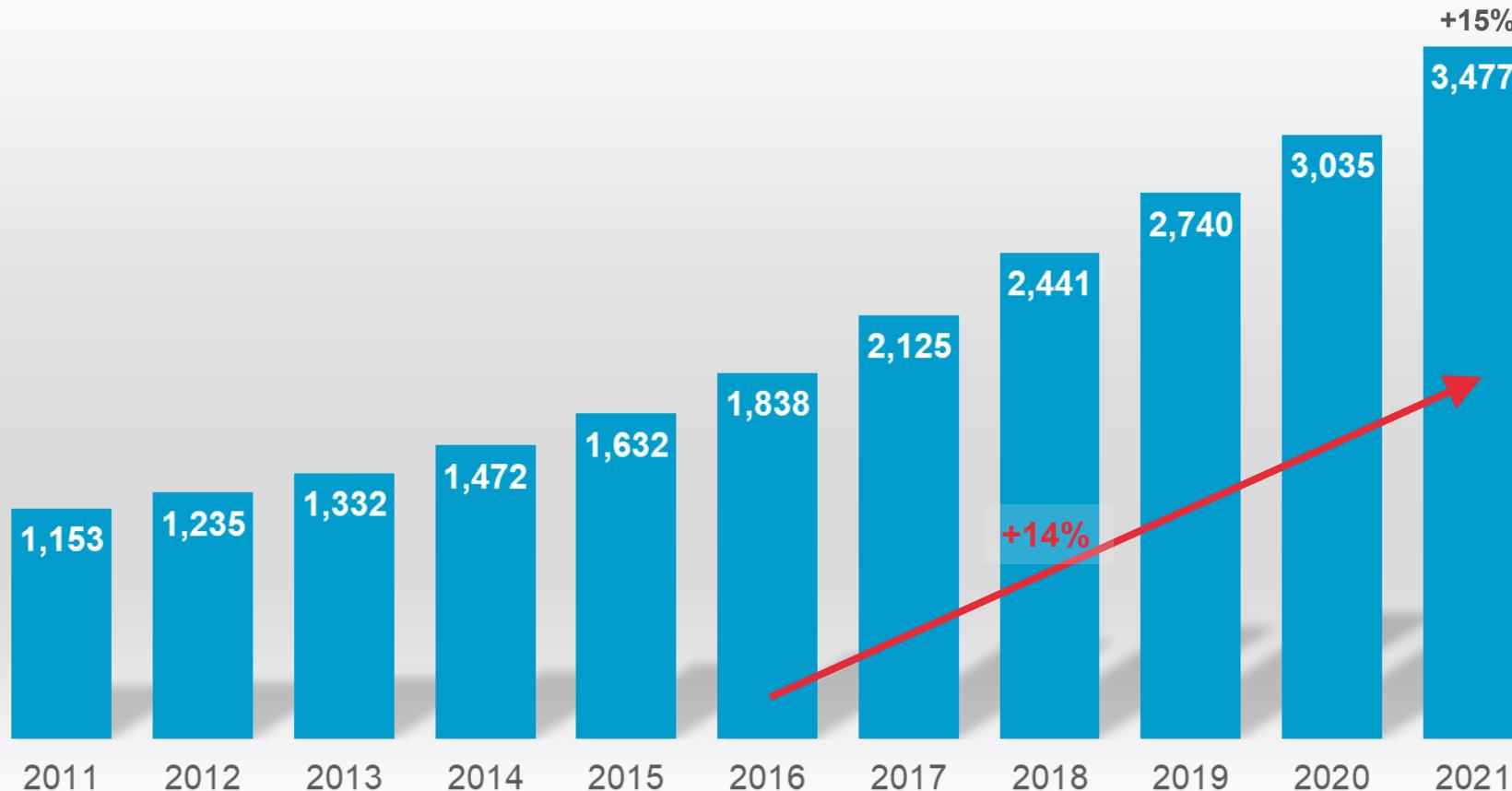


Source: World Robotics 2022

3 million industrial robots operating in factories around the world

Operational stock of industrial robots - World

1,000 units

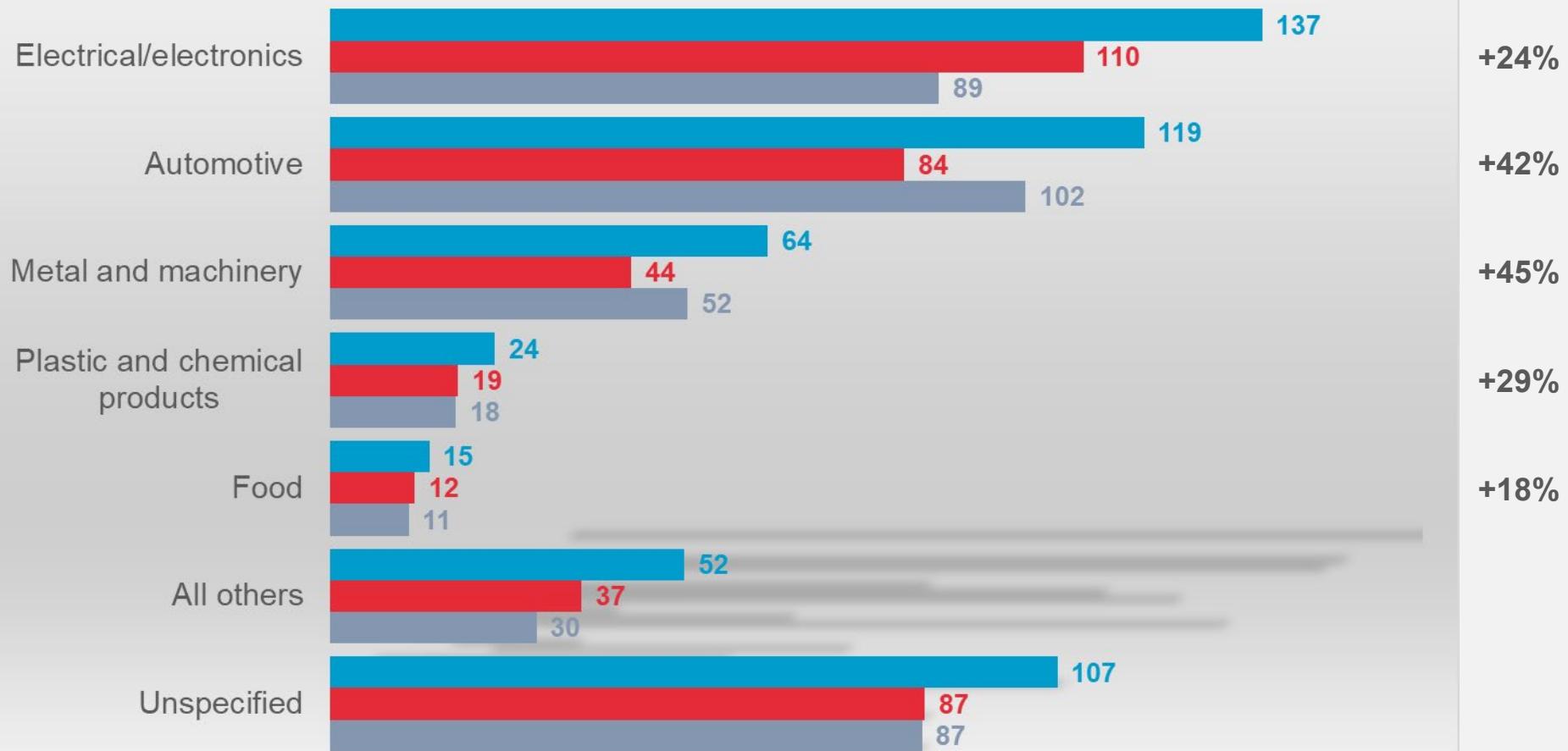


Source: World Robotics 2022

Electronics is major customer of industrial robots

Annual installations of industrial robots by customer industry - World

1,000 units



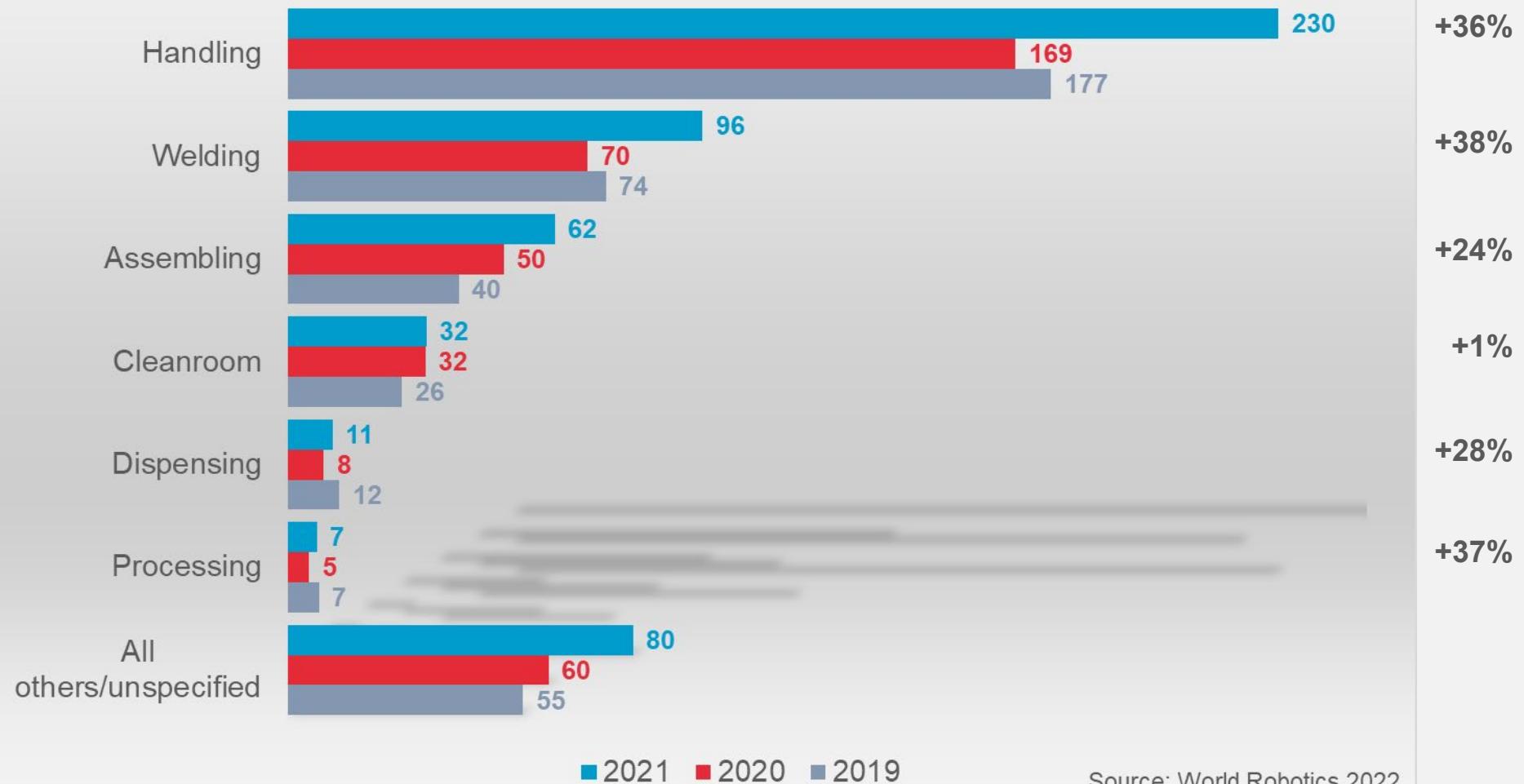
■ 2021 ■ 2020 ■ 2019

Source: World Robotics 2022

Handling is most important application with 44% share

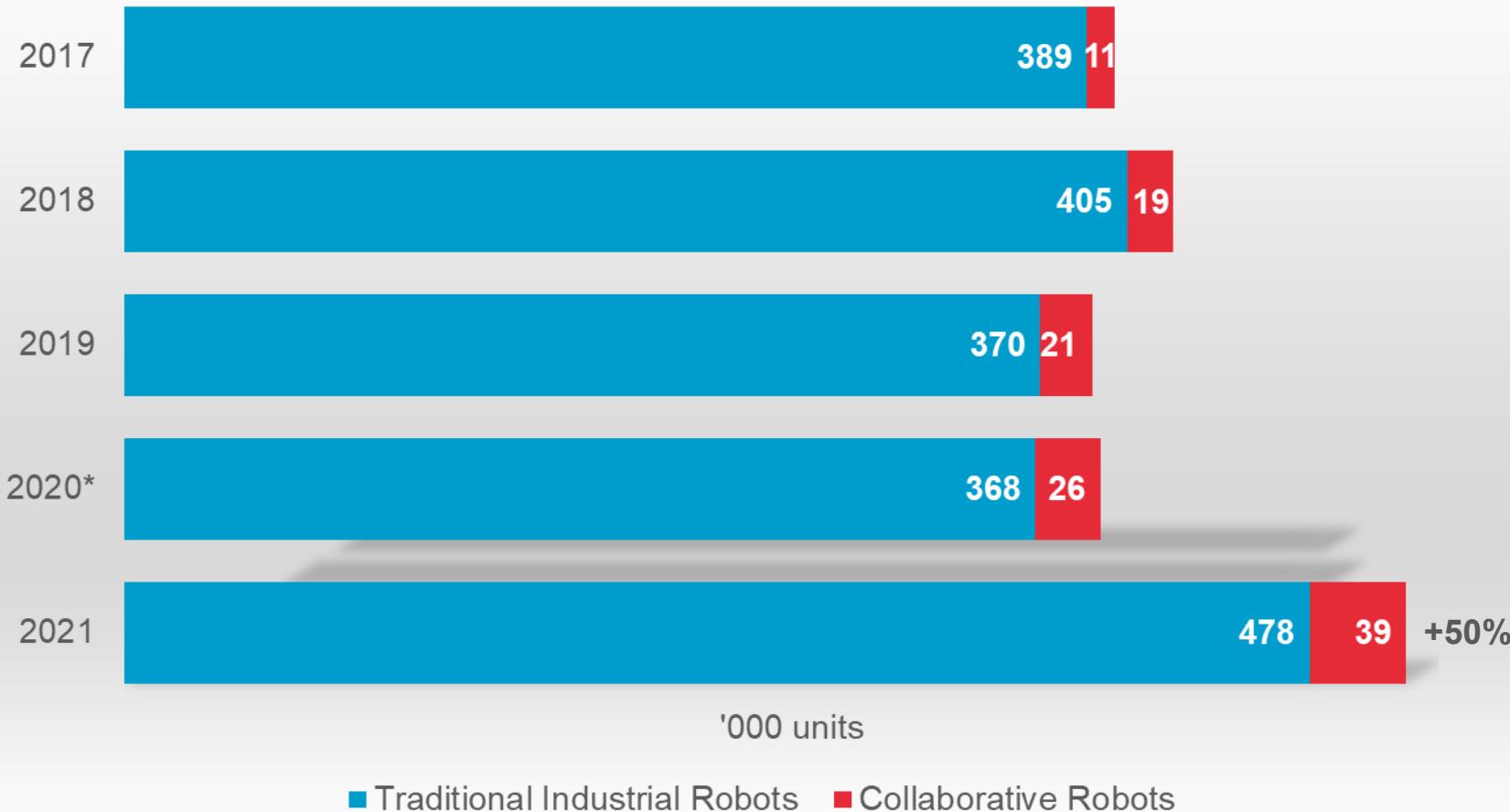
Annual installations of industrial robots by application - World

1,000 units



Collaborative robots steadily growing their market share

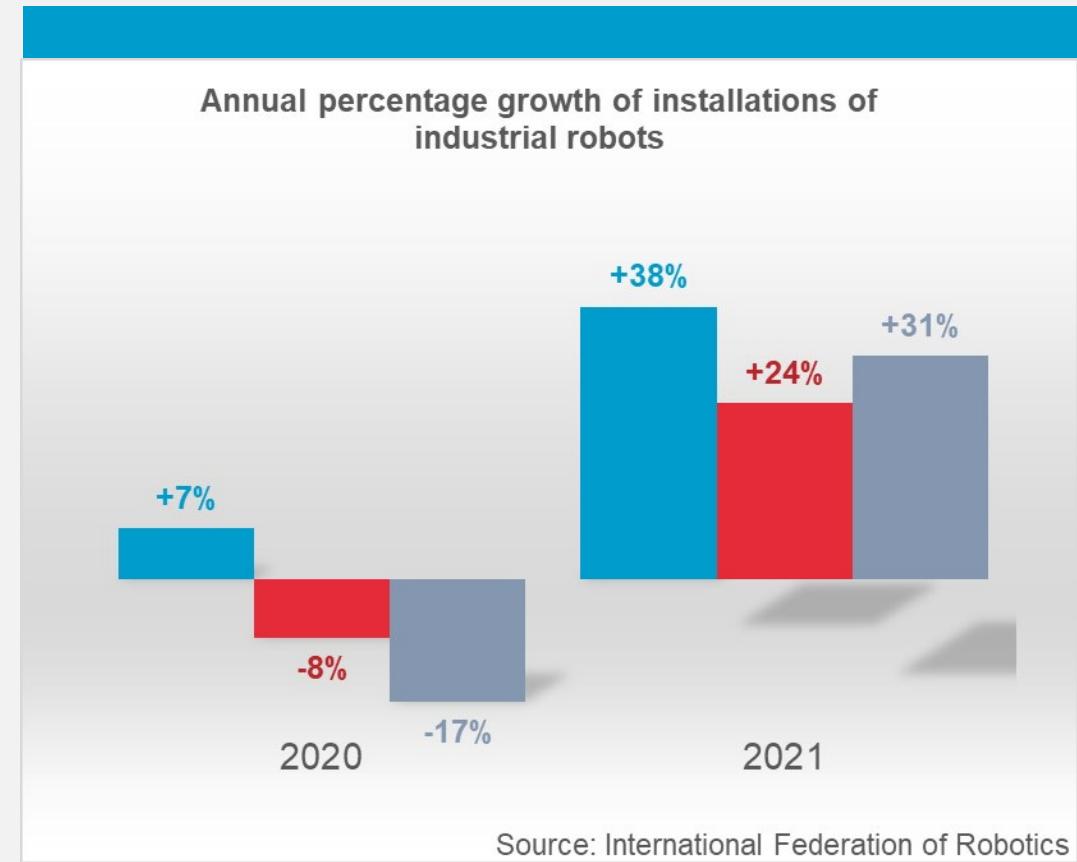
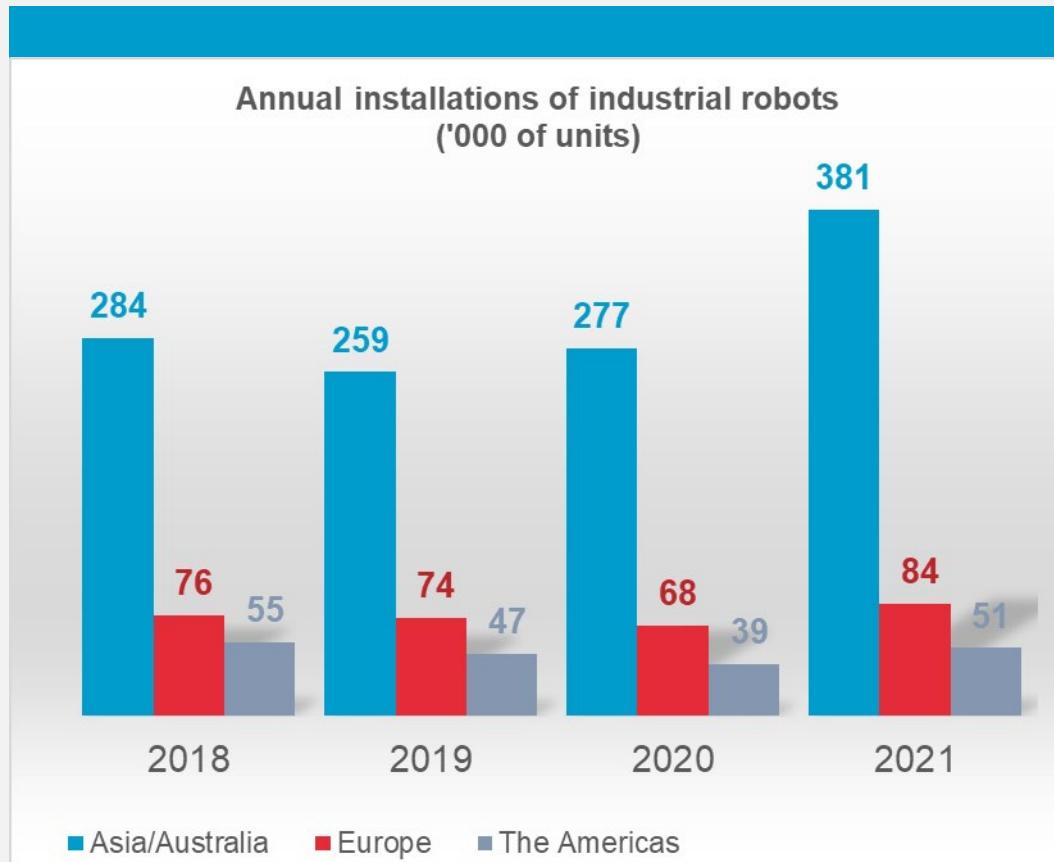
Collaborative and traditional industrial robots



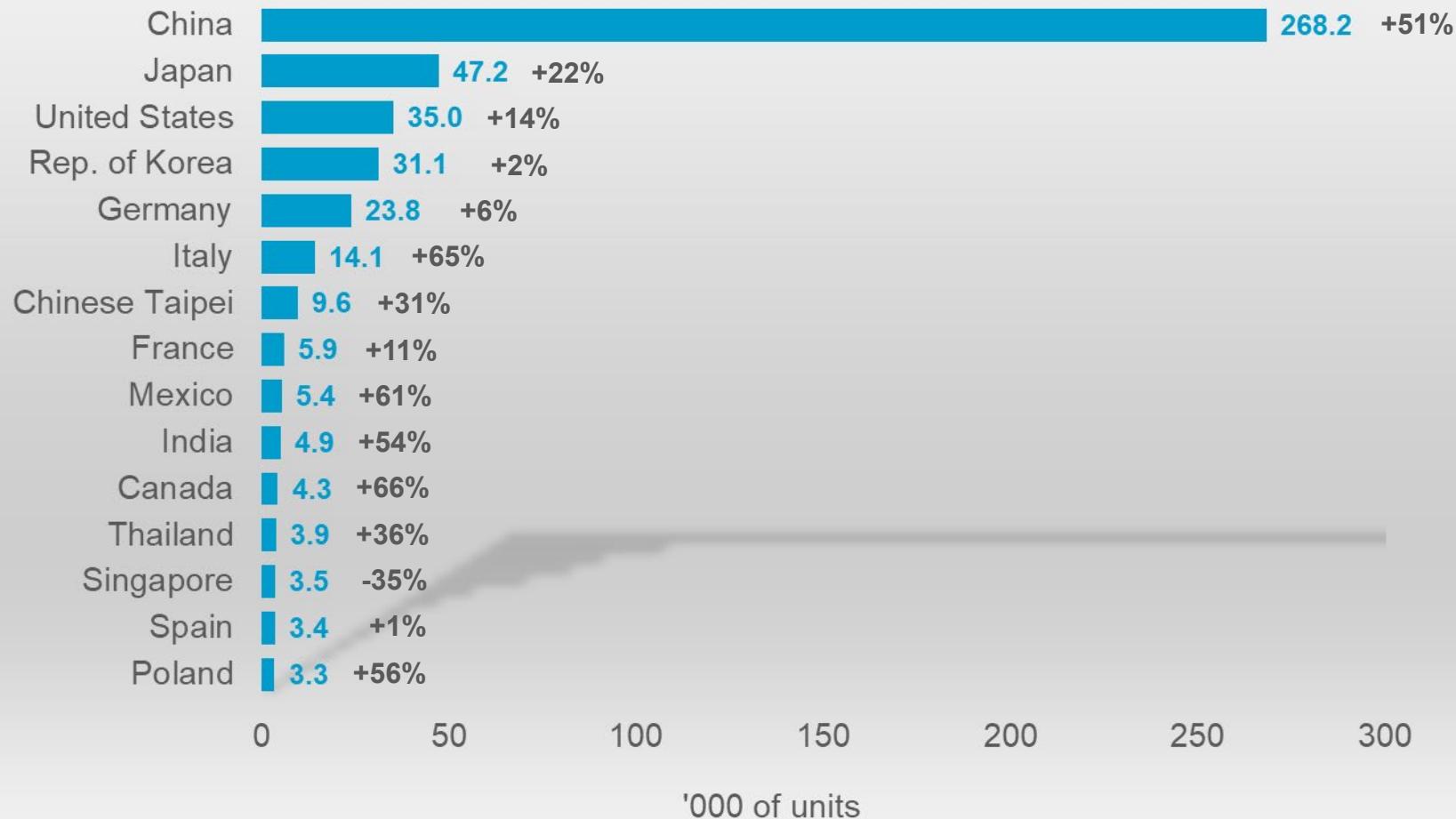
*revised

Source: World Robotics 2022

Strong growth in all regions



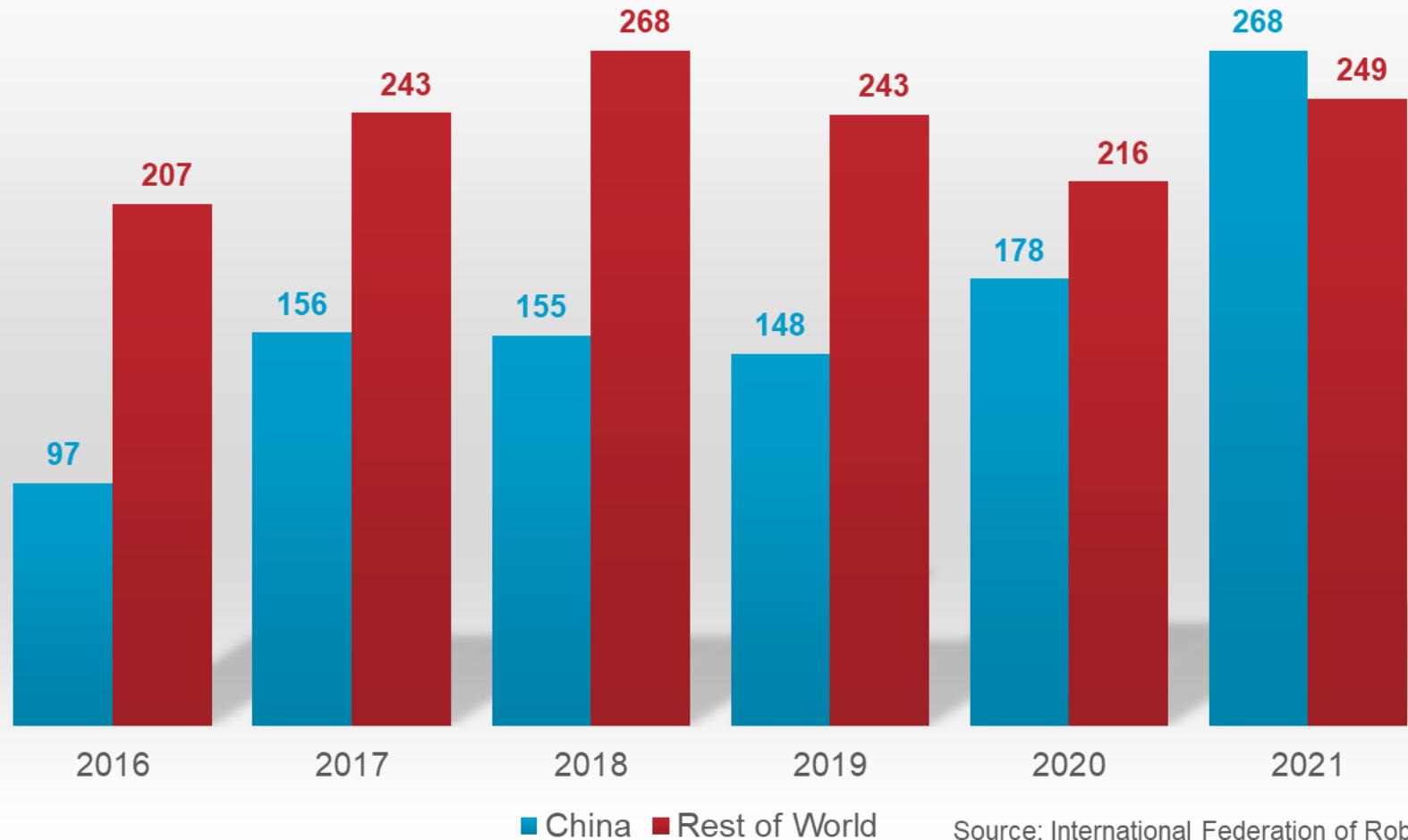
Annual installations of industrial robots 15 largest markets 2021



Source: World Robotics 2022

China now installs more industrial robots per year than the rest of the world taken together

Annual installations of industrial robots
('000 of units)

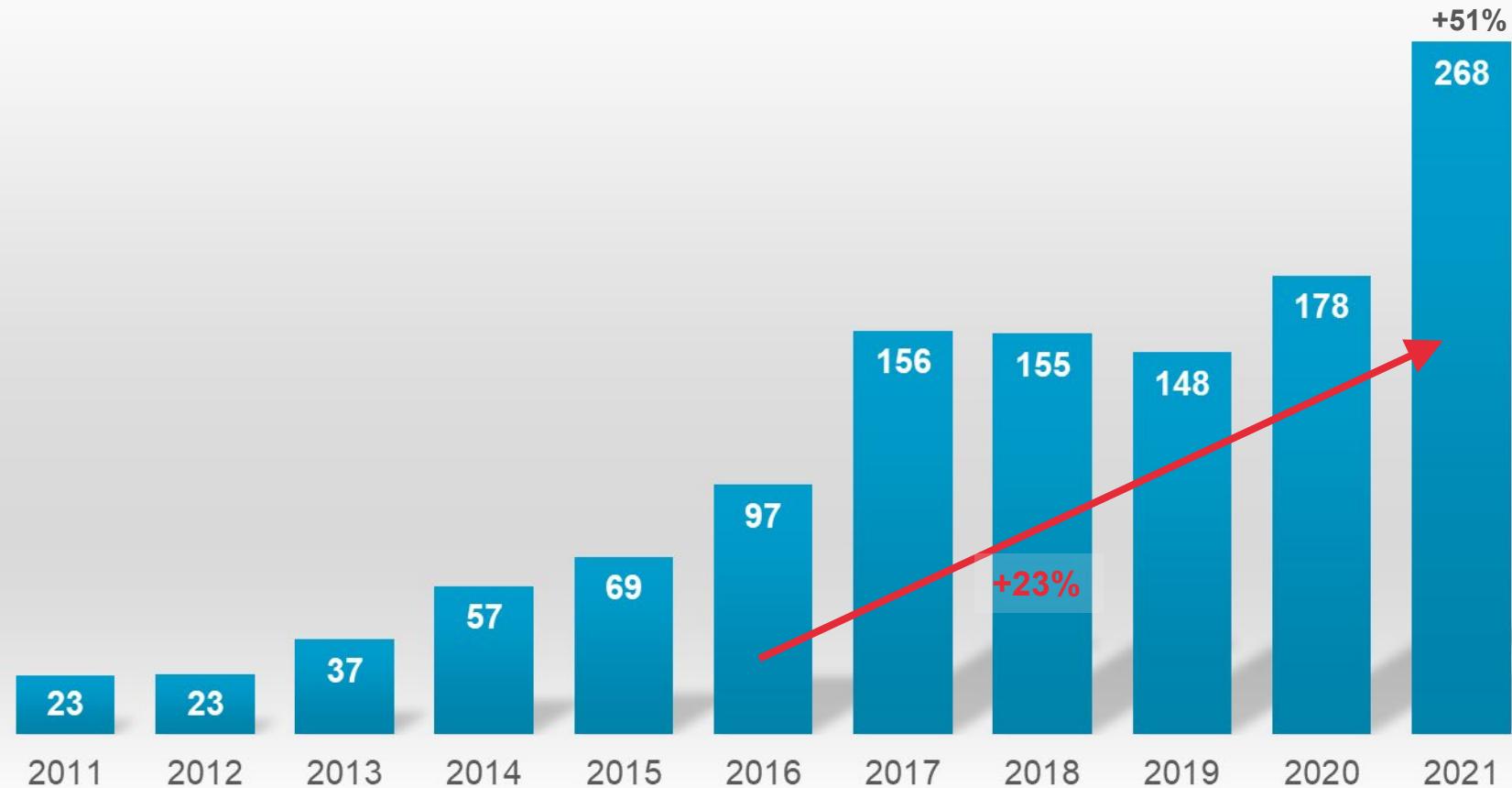


Source: International Federation of Robotics

China multiplied its annual installations by more than factor 11 in a decade

Annual installations of industrial robots - China

1,000 units

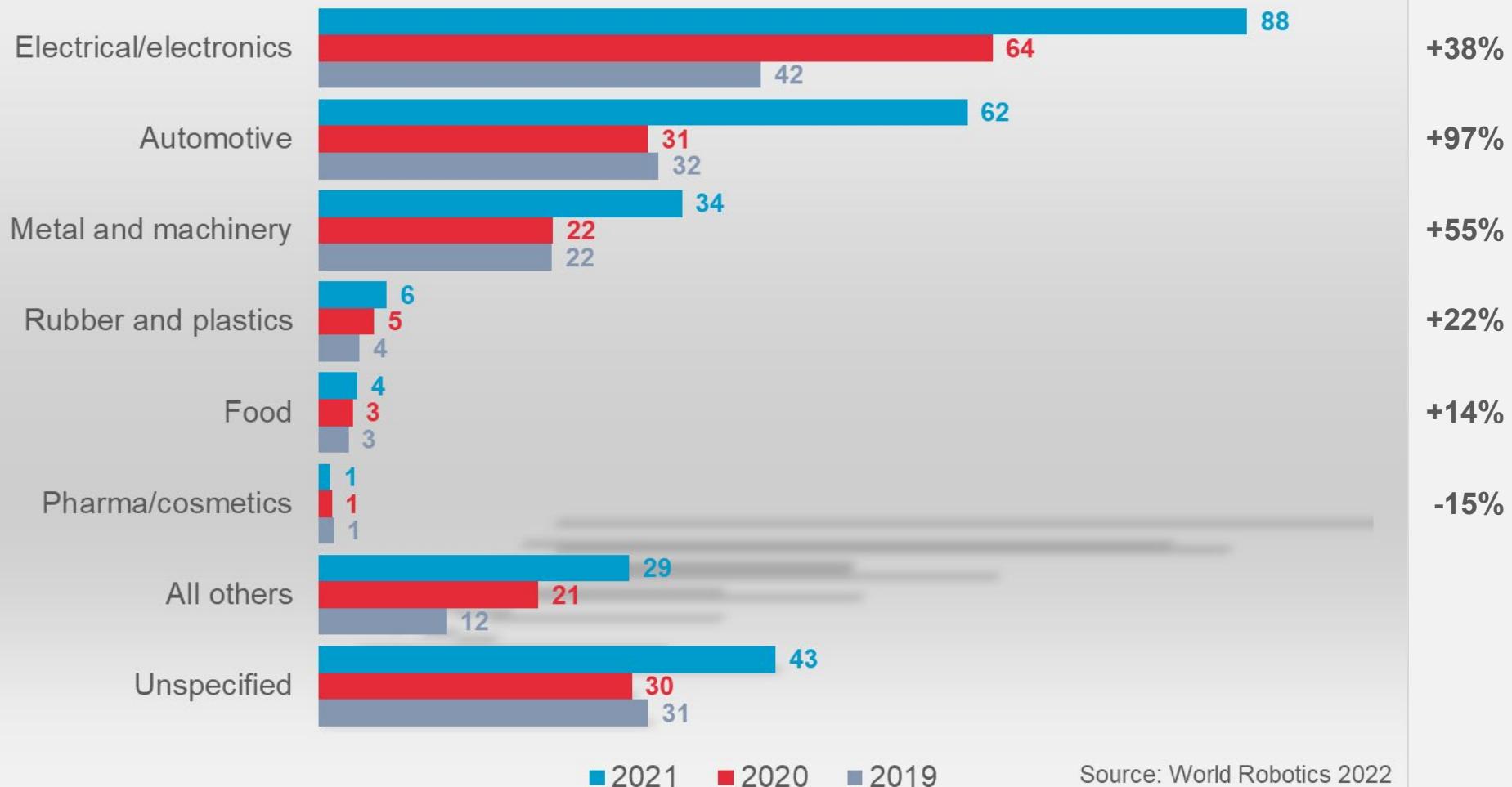


Source: World Robotics 2022

China's electronics industry is the main customer

Annual installations of industrial robots by customer industry - China

1,000 units



Japan recovers strongly – third highest installation count ever recorded

Annual installations of industrial robots - Japan

1,000 units

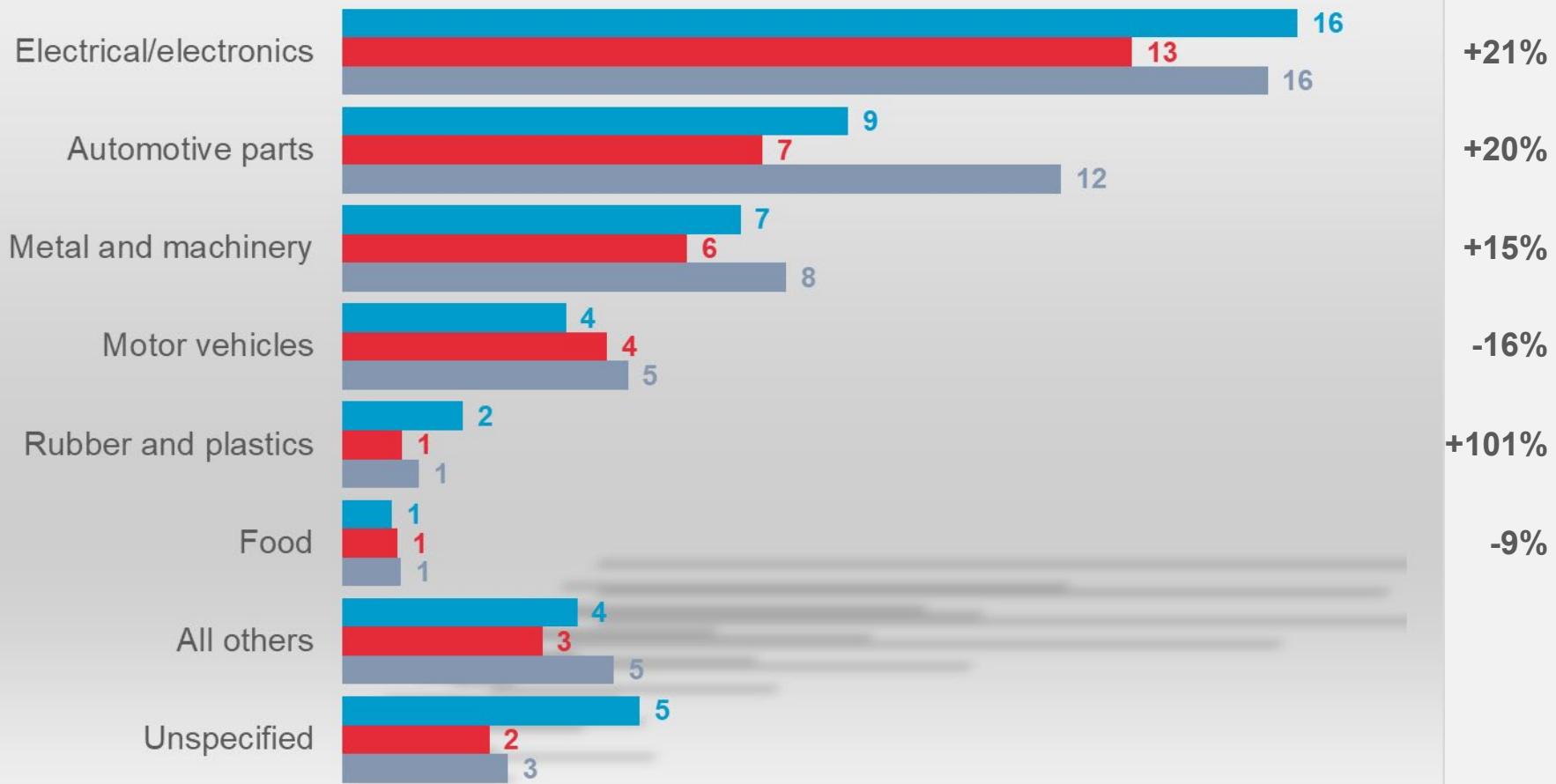


Source: World Robotics 2022

Japan's electronics and automotive industry demand high quantities

Annual installations of industrial robots by customer industry - Japan

1,000 units

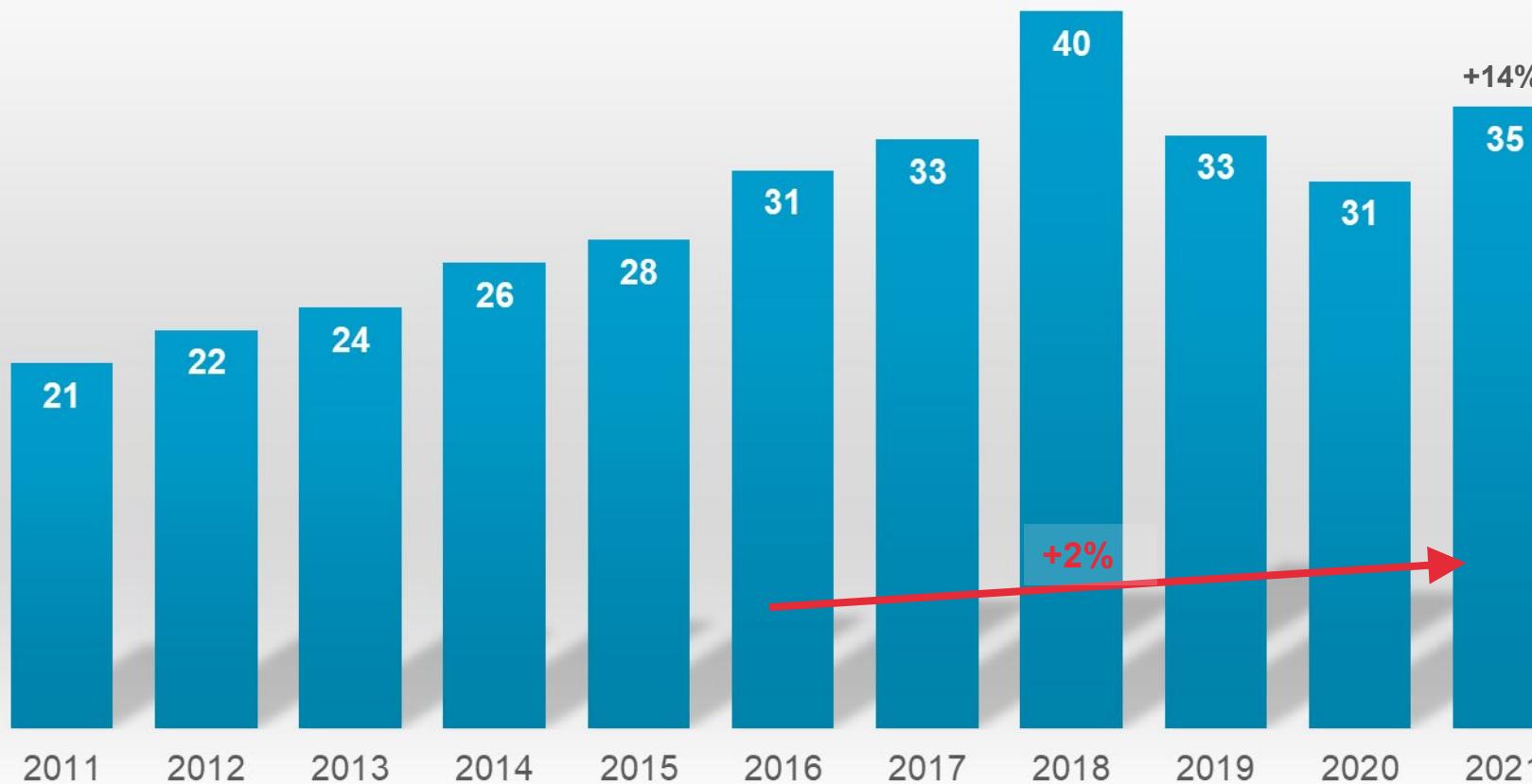


Source: World Robotics 2022

Second highest level ever recorded in the United States

Annual installations of industrial robots - United States

1,000 units

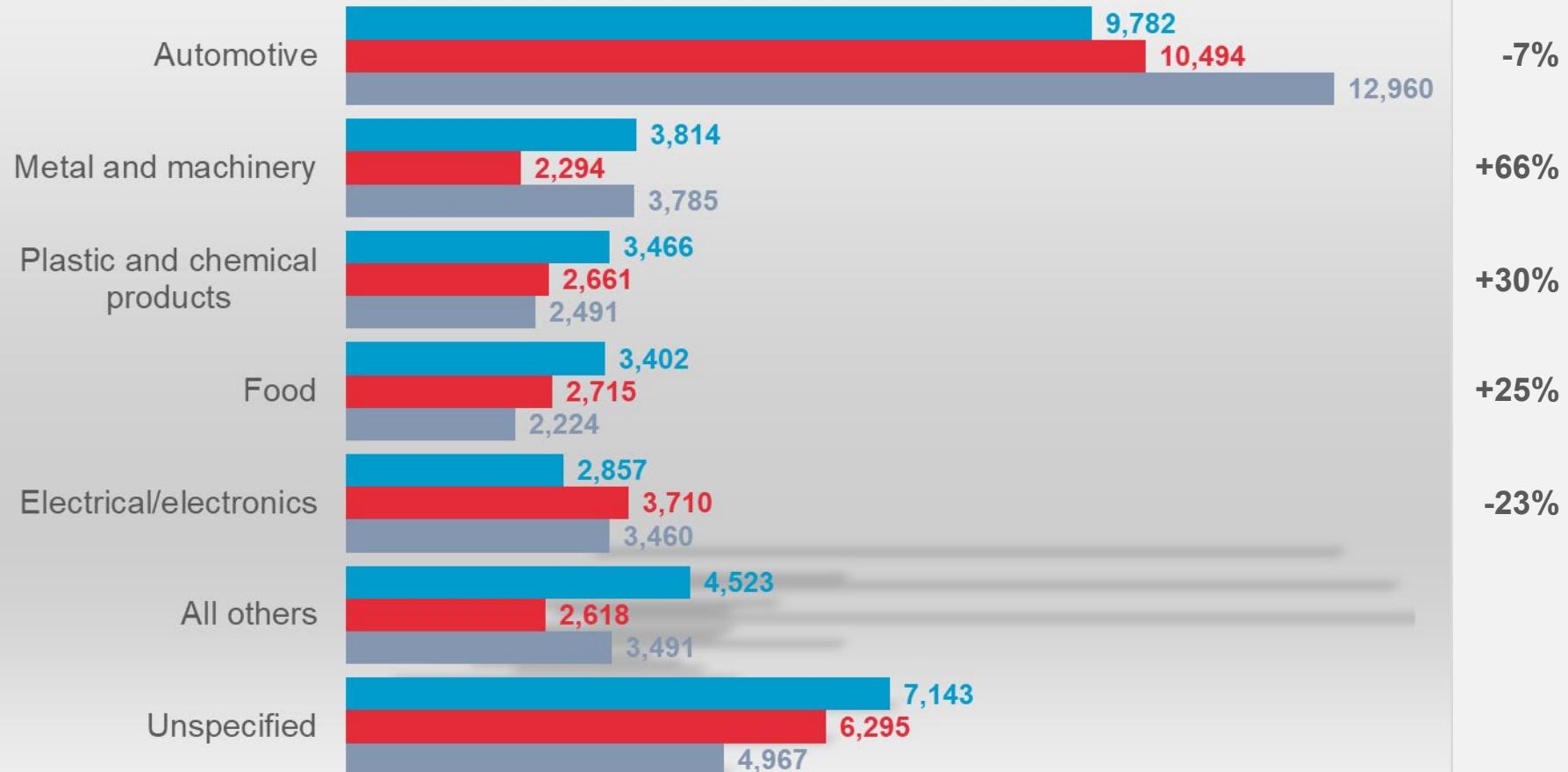


Source: World Robotics 2022

US General Industry driving growth

Annual installations of industrial robots by customer industry - United States

units



■ 2021 ■ 2020 ■ 2019

Source: World Robotics 2022

Annual installations of industrial robots - Rep. of Korea

1,000 units



Source: World Robotics 2022

Robot demand from the Korean electronics industry down by 10%

Annual installations of industrial robots by customer industry - Rep. of Korea

units



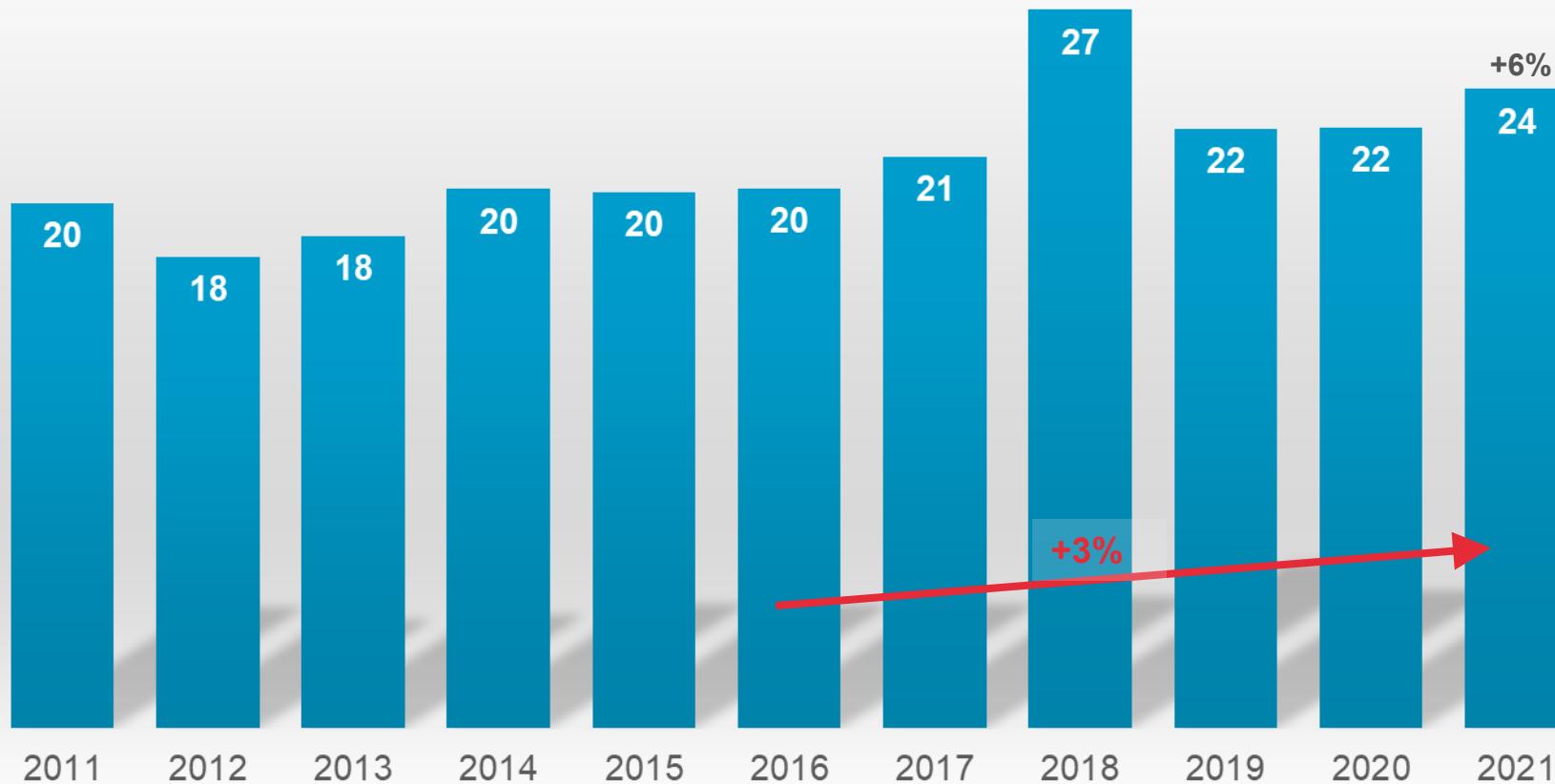
■ 2021 ■ 2020 ■ 2019

Source: World Robotics 2022

Demand for industrial robots in Germany growing slowly

Annual installations of industrial robots - Germany

1,000 units

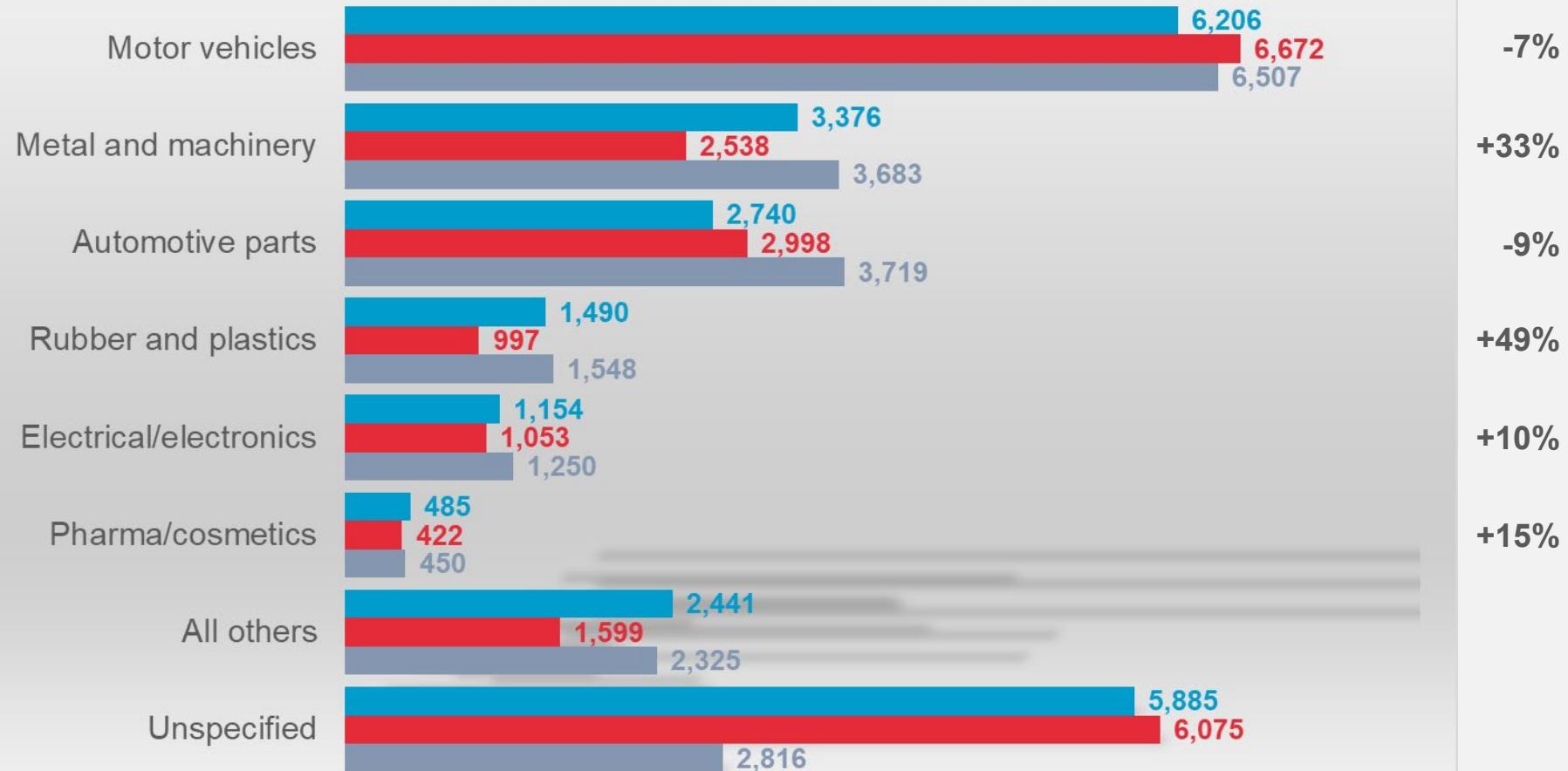


Source: World Robotics 2022

Automotive is still the major customer in Germany

Annual installations of industrial robots by customer industry - Germany

units



■ 2021 ■ 2020 ■ 2019

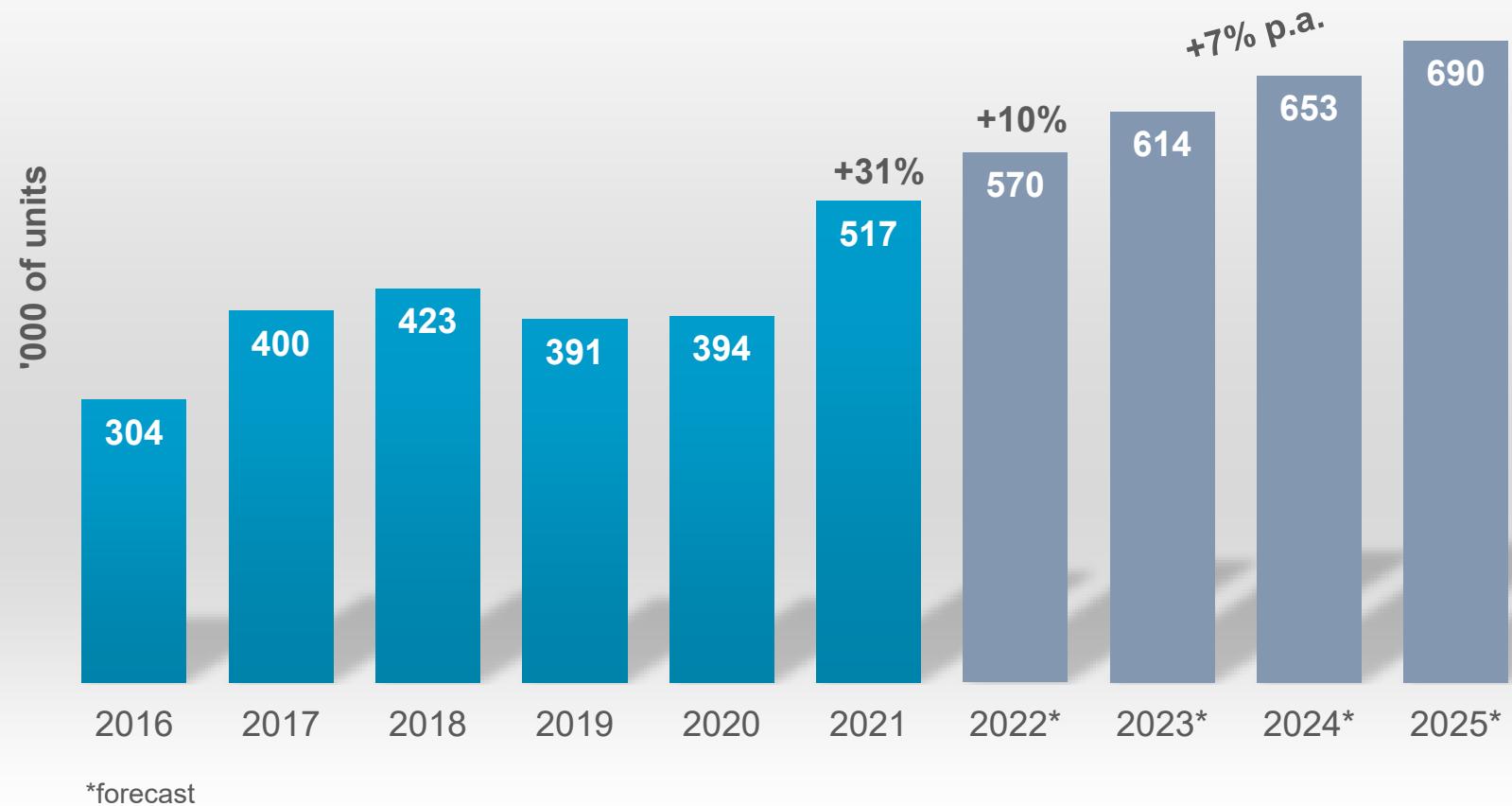
Source: World Robotics 2022

Trends and Forecast



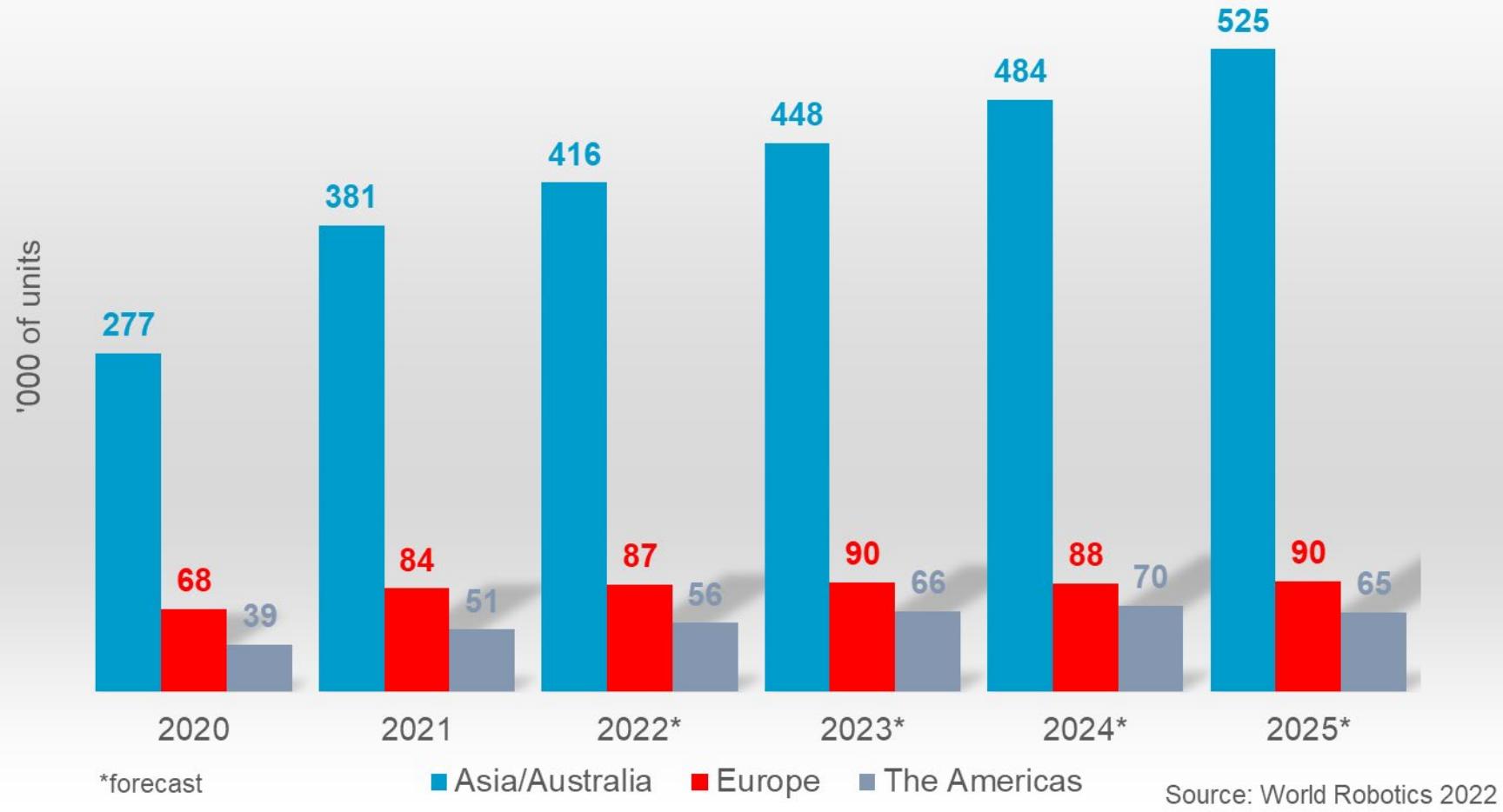
Excellent growth prospects for 2022

Annual installations of industrial robots 2016-2021 and 2022*-2025*



Source: World Robotics 2022

Annual installations of industrial robots 2020-2021 and 2022*-2025*



Short-term market determinants

- **Macroeconomic headwinds**
 - High inflation in the Americas and Europe
 - Tightening of monetary policy
 - Slowdown of Chinese economy
- **Geopolitical tensions leading to uncertainty**
- **Covid-19 restrictions still hamper business activities**
 - Travel restrictions / quarantine requirements
 - Local outbreaks interrupt supply chains



Short-term market determinants

- **Full order books**
 - Strong order intake in 2022
- **Scarcity of raw materials** and intermediate products
 - Transportation challenge
 - Longer lead times
 - Growing order backlog
- Continued **demand from electronics industry**
- **Political support**
 - Ongoing government incentives (e.g. “NextGenerationEU”)
 - Ambitious targets force automotive industry to invest
 - 100% electric vehicles in EU by 2035
 - 50% New Energy Vehicles in China by 2035
- **Labor scarcity** in many developed economies

Market trends

- **Re- and nearshoring of production**
 - Securing supply chains
 - Increasing resilience and flexibility (logistics, politics)
- **“Democratizing” robotics**
 - Low-cost robotics opens up new customer segments
 - Easy setup and installation (out-of-the-box solutions)
 - New distribution channels
- **Ongoing trend to high mix-low volume production**
 - Growing demand for highly customized products
 - Fully digitalized production from order intake to delivery.



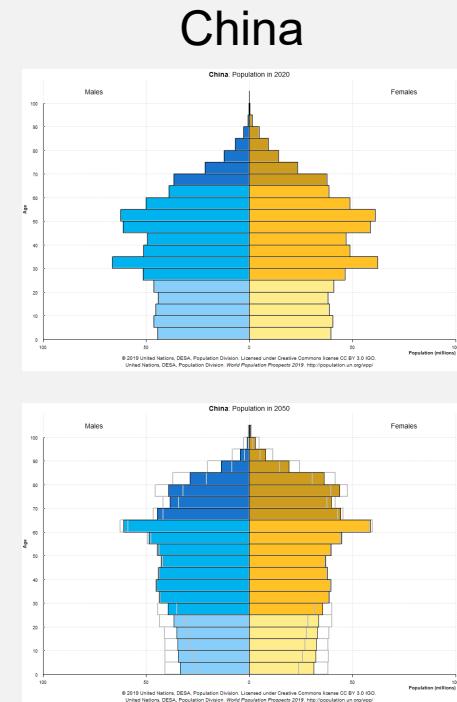
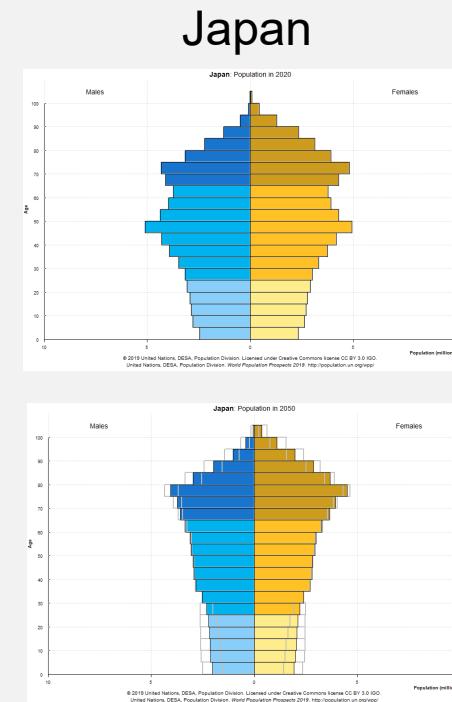
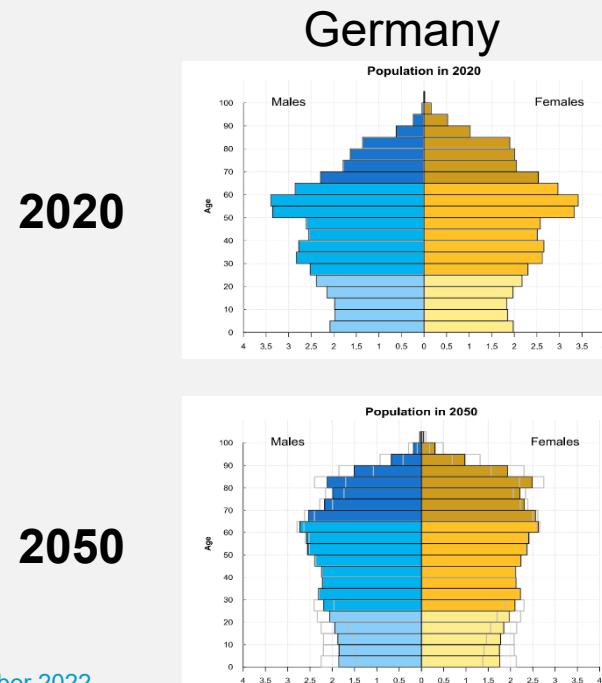
Technological trends

- **Sustainable development**
 - Reducing the carbon footprint of production
 - Responsible industrialization
 - Contributing to the accessibility/availability of renewable energies
- **Advancements in adjacent technologies**
 - Vision and spacial awareness technologies
 - New software and end effectors for a diversified range of tasks
 - AI offering new applications
- **Human-robot collaboration steadily developing**
 - Expanding product range with higher payloads and longer reach
 - Business ecosystems & one-stop shops ease the deployment
 - Ease of use is a driver for the use of cobots



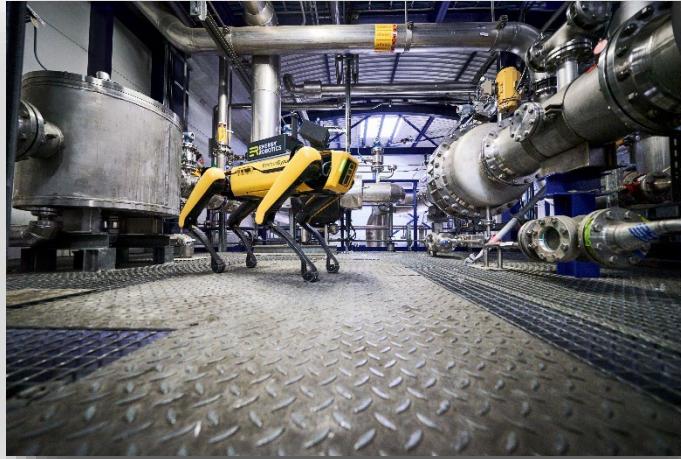
Long-term Growth Driver: Demographic change

- Low birth rates (< 2.1 children per woman) and babyboom generation going to retire
 - Growing need for elderly care
 - Situation similar in major economies
- **Massive labor shortage to be expected**



Source: United Nations

Labor Shortage beyond the Manufacturing Industry



Source: Energy Robotics, PAL Robotics



Source: FarmDroid, DeLaval



- Intralogistics
 - in factories and e-commerce
- Professional Cleaning
- Inspection and Maintenance
- Hospitality
- Agriculture

Megatrends

24% of global retail sales online by 2026

Statista



Building square footage +39% by 2050 in the US

Health Care Weekly



Worldwide housing crisis - impacting 1.6 billion people by 2025

Worldbank



15 mn health care workers missing worldwide by 2030

WHO



What's next?

Glyphosat ban worldwide

WHO



Service robots – top findings



2021: Continuous growth

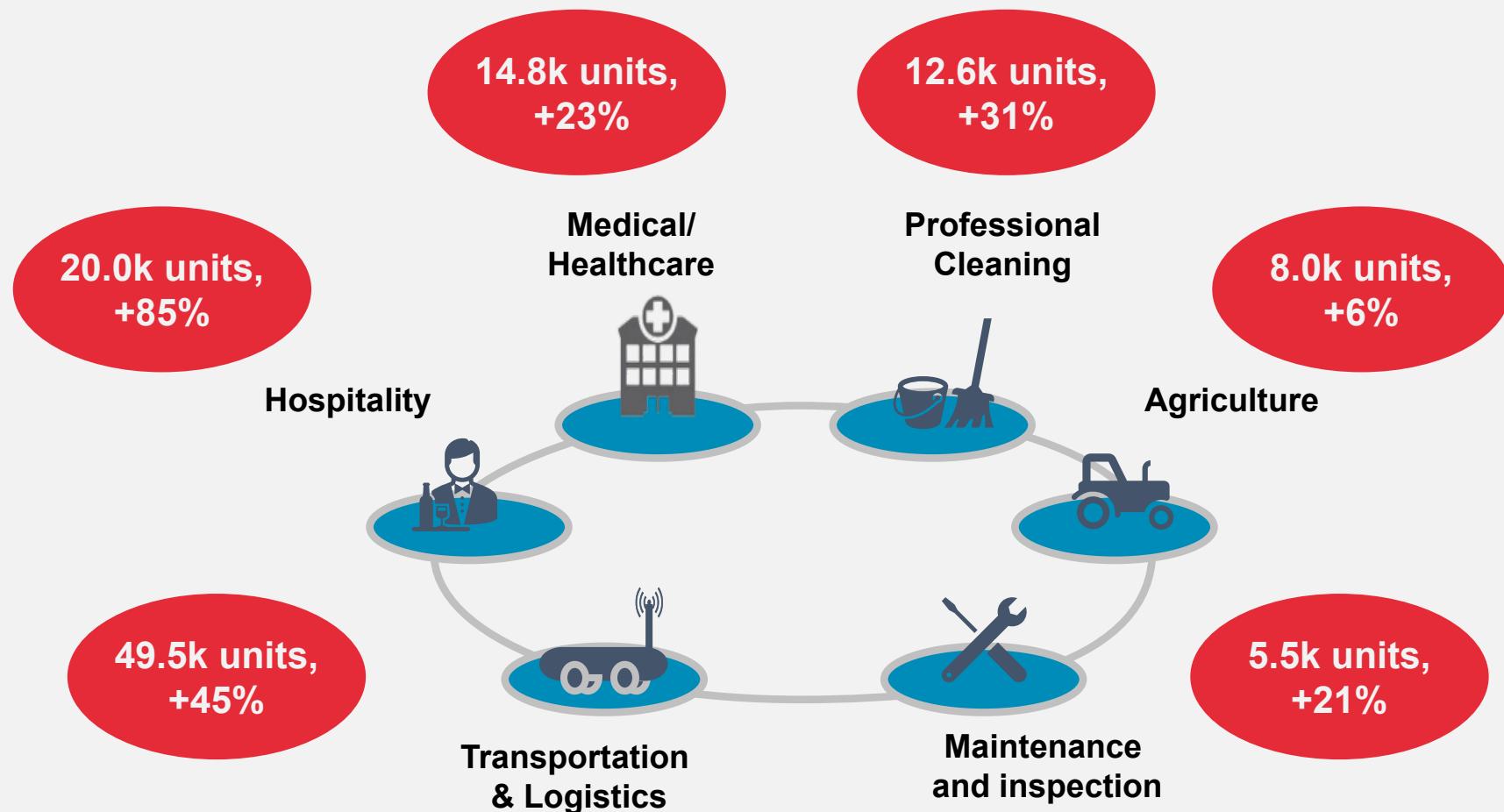
New professional service robots*

- 121,000 units (+37%)

New consumer service robots

- 19 million units (+9%)

*All numbers based on a sample of 229 companies and 2 association reports



Transportation & Logistics

49.5k units,
+45%

State of the art



Future trend



Hospitality

20.0k units,
+85%

State of the art



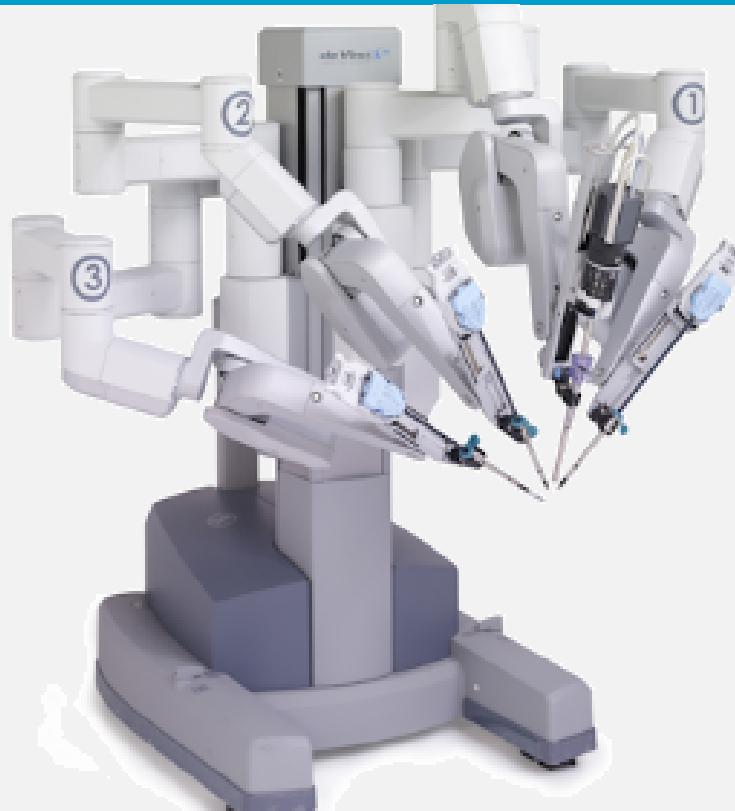
Future trend



Medical/Healthcare

14.8k units,
+23%

State of the art



Future trend



Professional Cleaning

12.6k units,
+31%

State of the art



Future trend



Agriculture

8.0k units,
+6%

State of the art



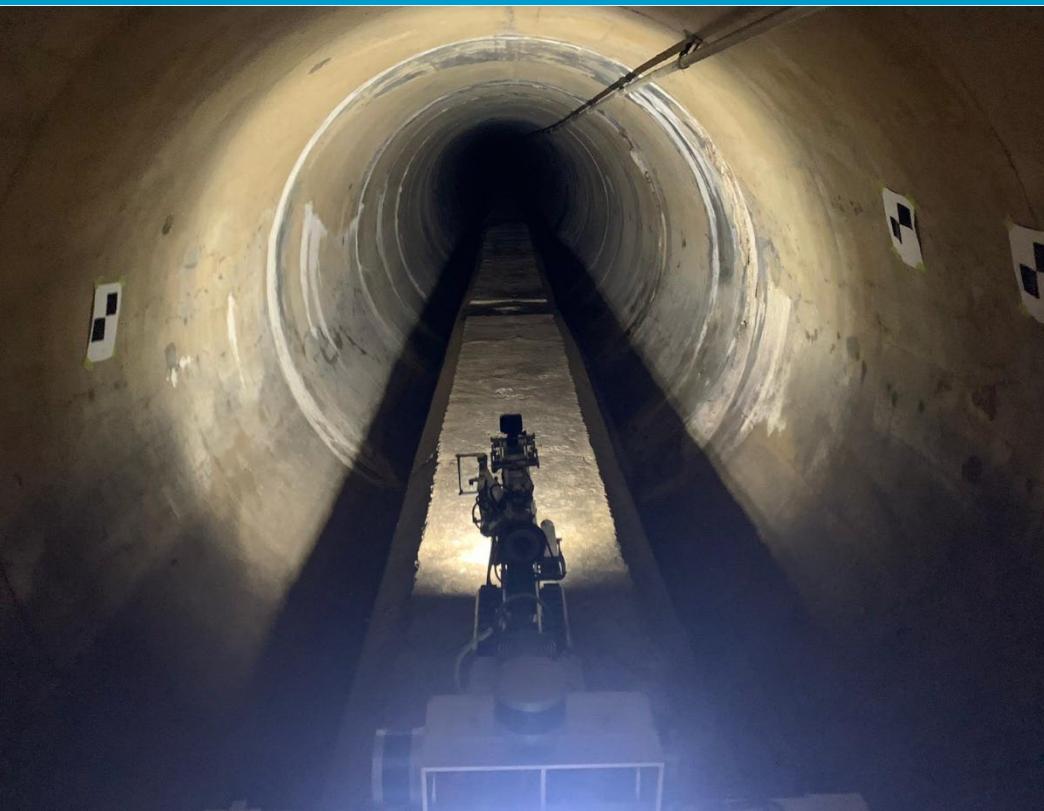
Future trend



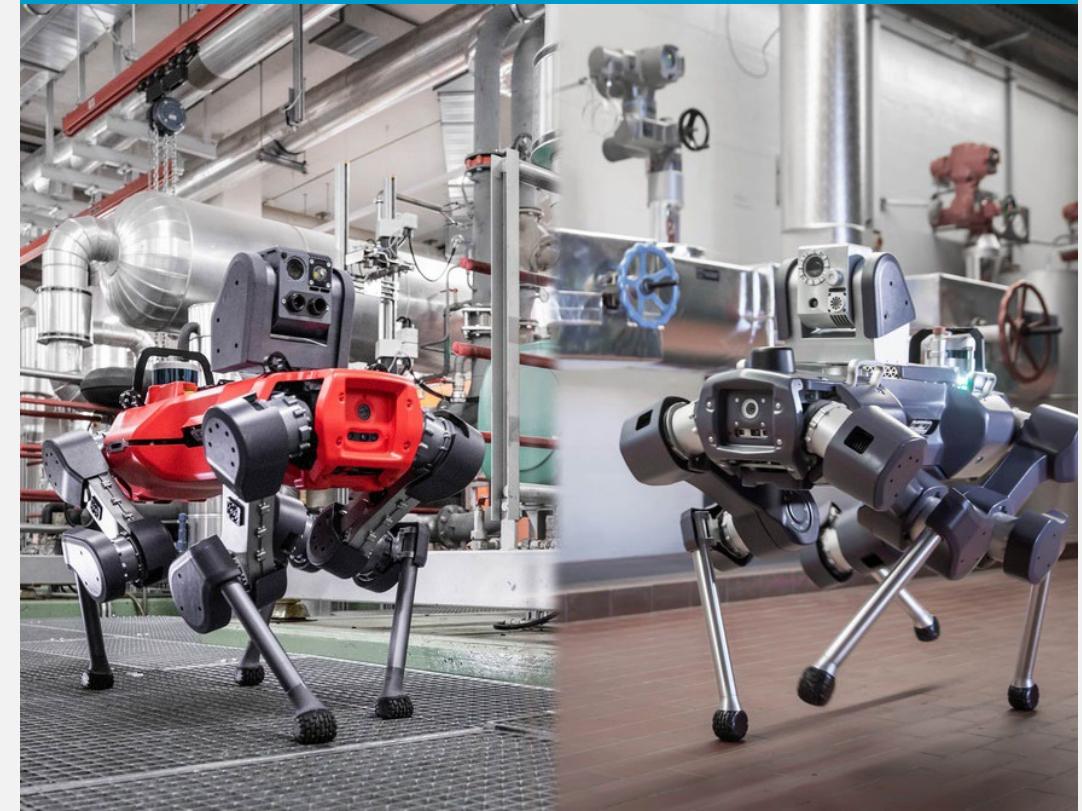
Maintenance and inspection

5.5k units,
+21%

State of the art



Future trend

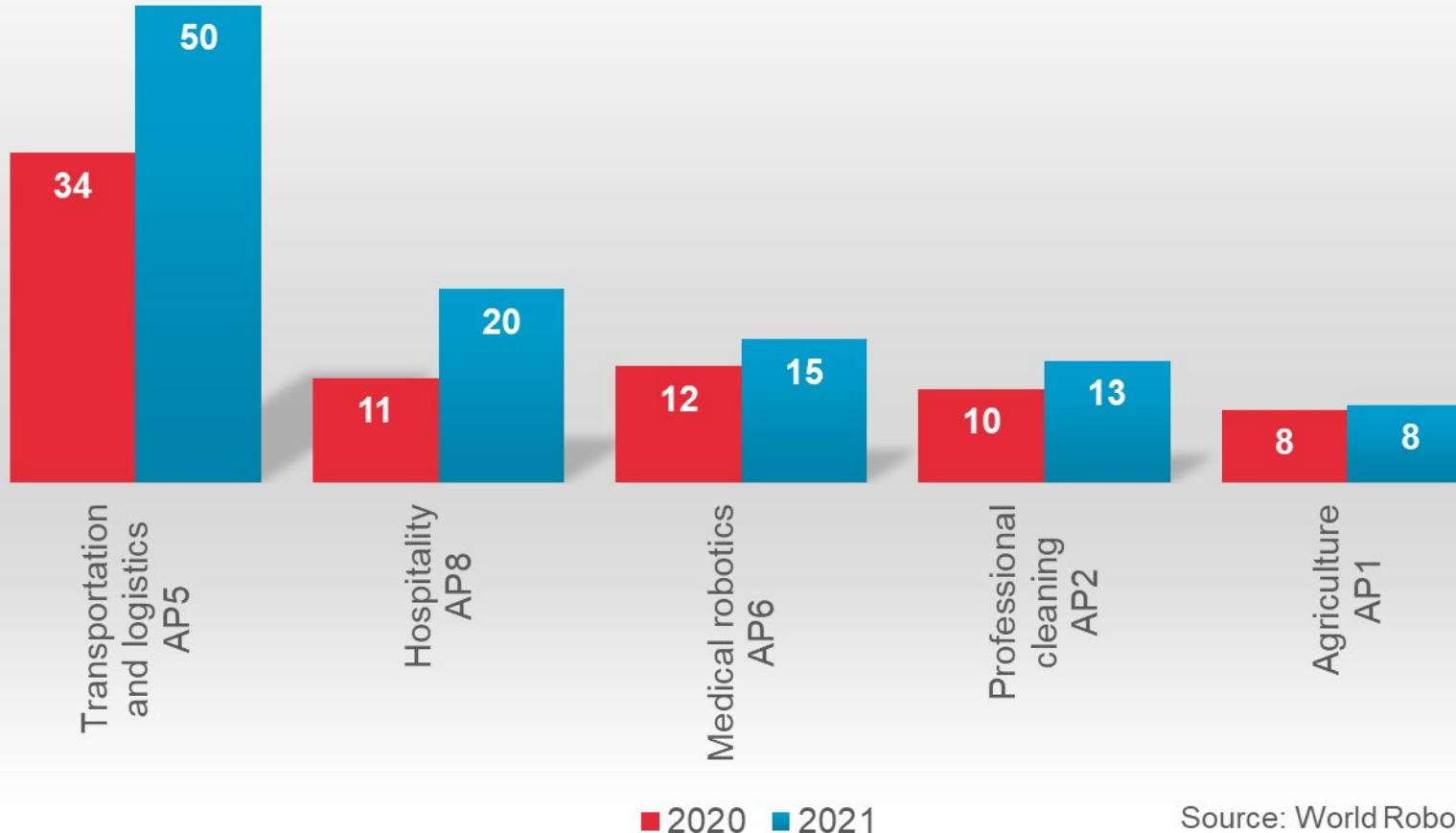


Main professional applications

Service robots for professional use. Top 5 applications

Unit sales 2020 and 2021

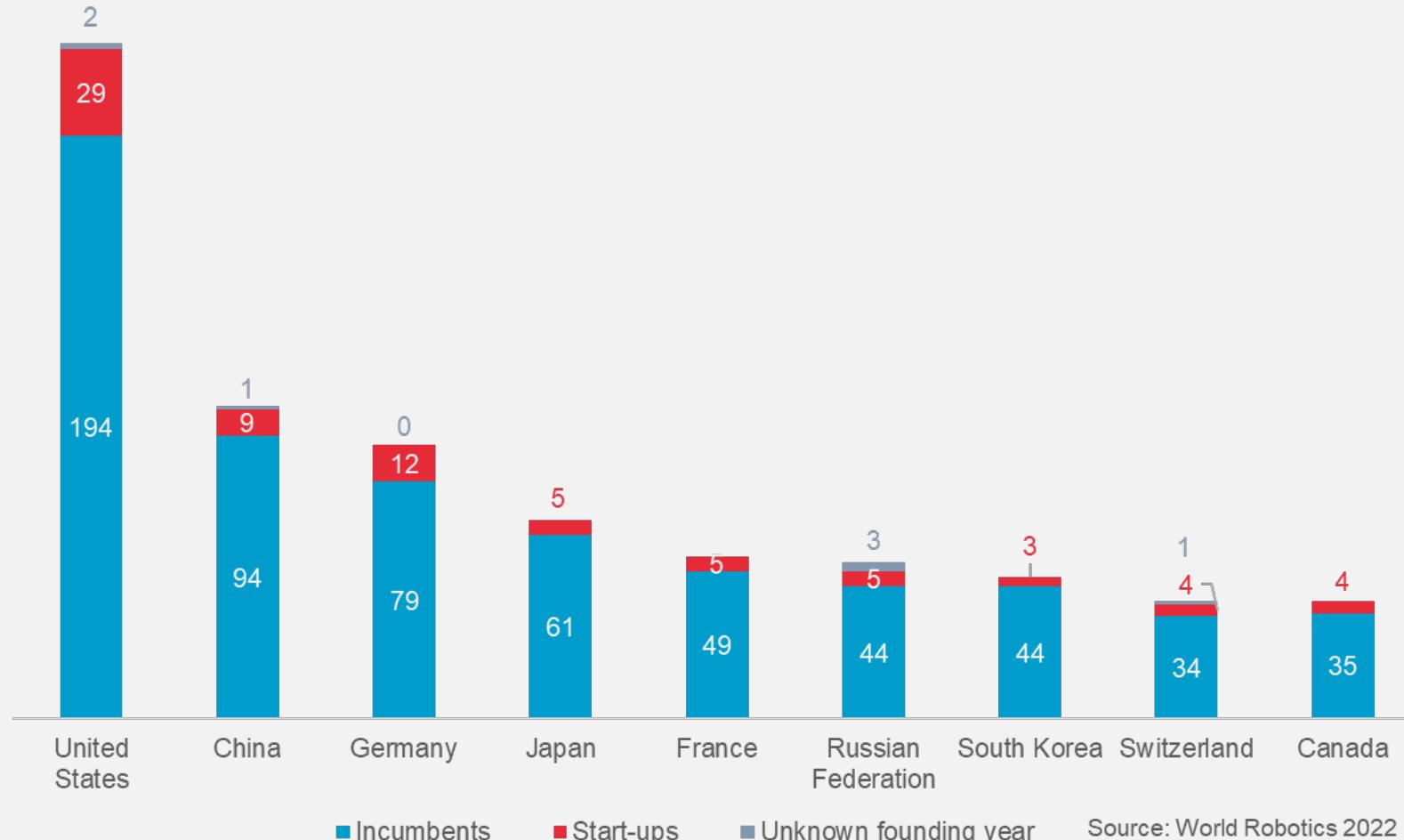
'000 of units



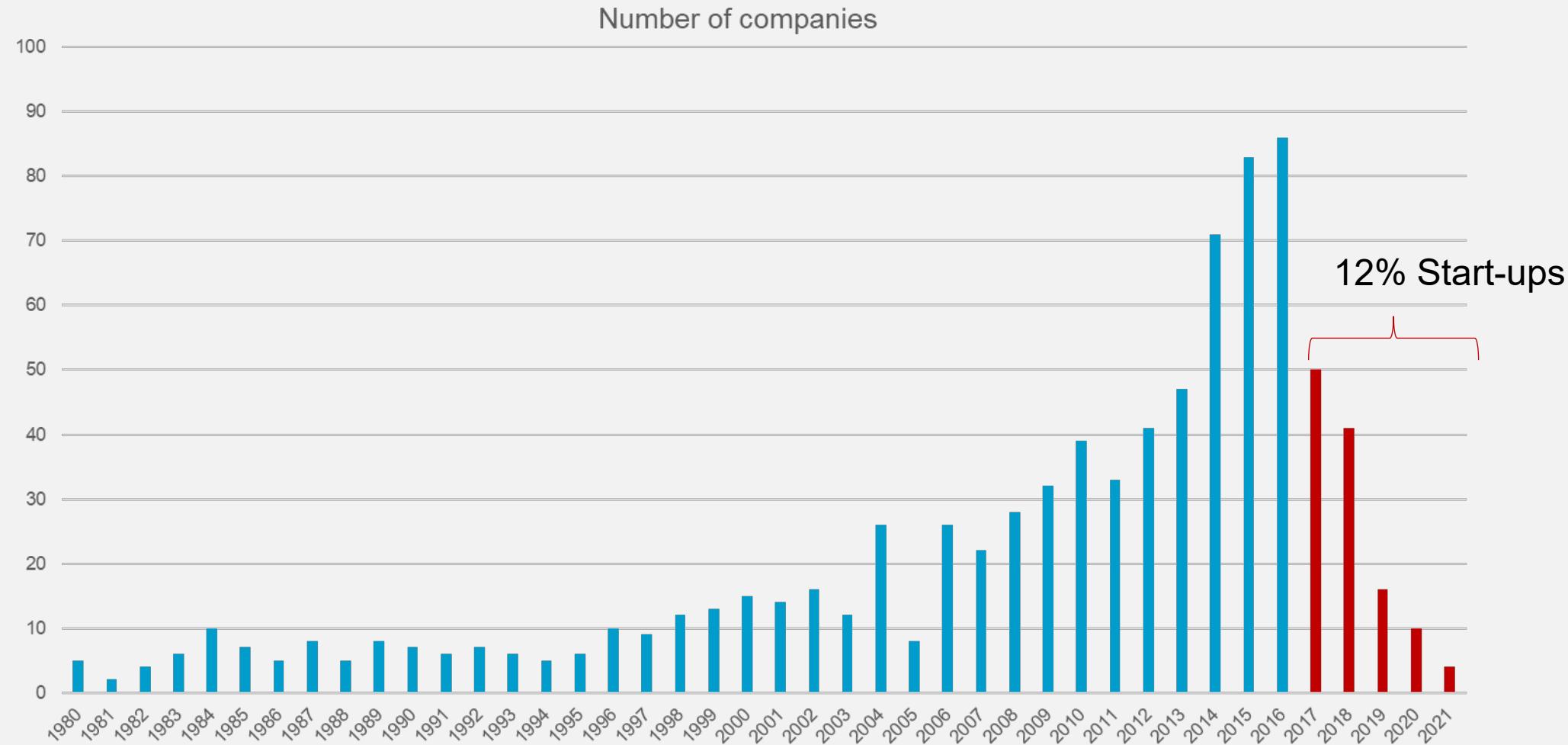
Source: World Robotics 2022

The United States is home of most service robot suppliers

Service robot manufacturers by country (top 10)
all applications

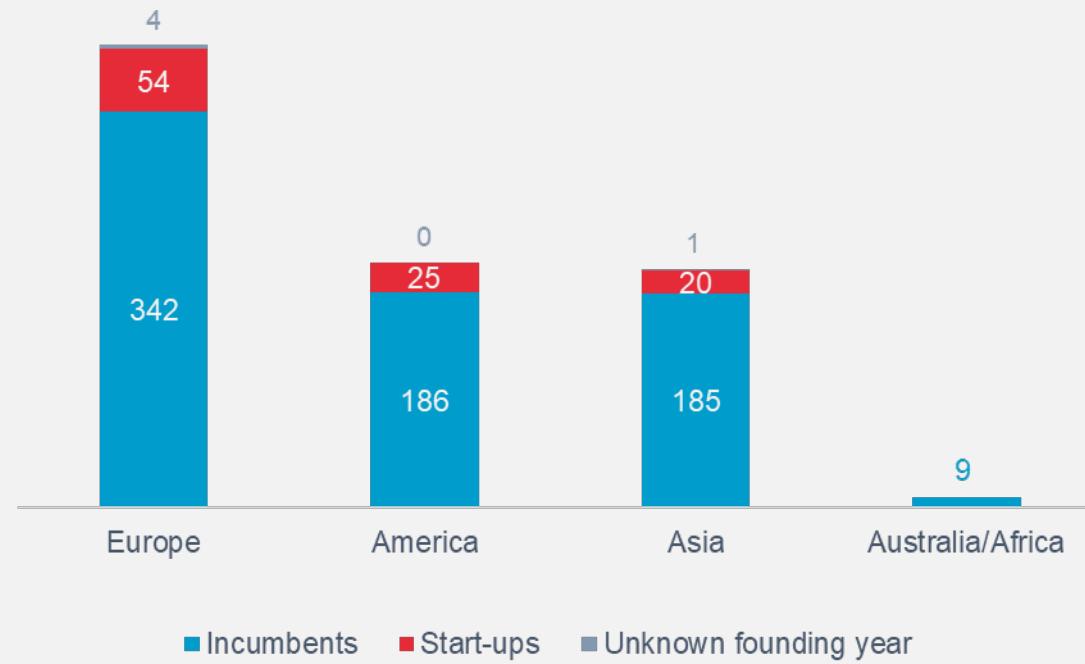


2013-2016: baby boom years for service robotics

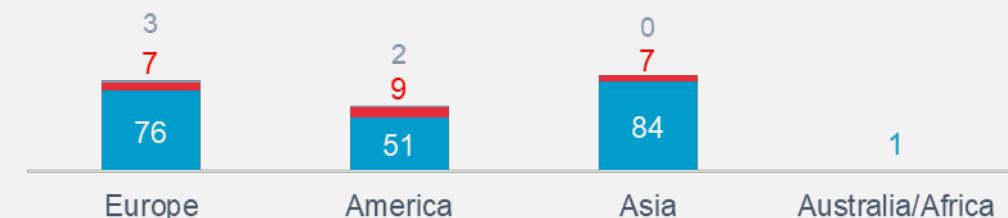


More than 1,000 service robot suppliers worldwide – start-ups becoming mature

Number of service robot suppliers by region and age - professional applications



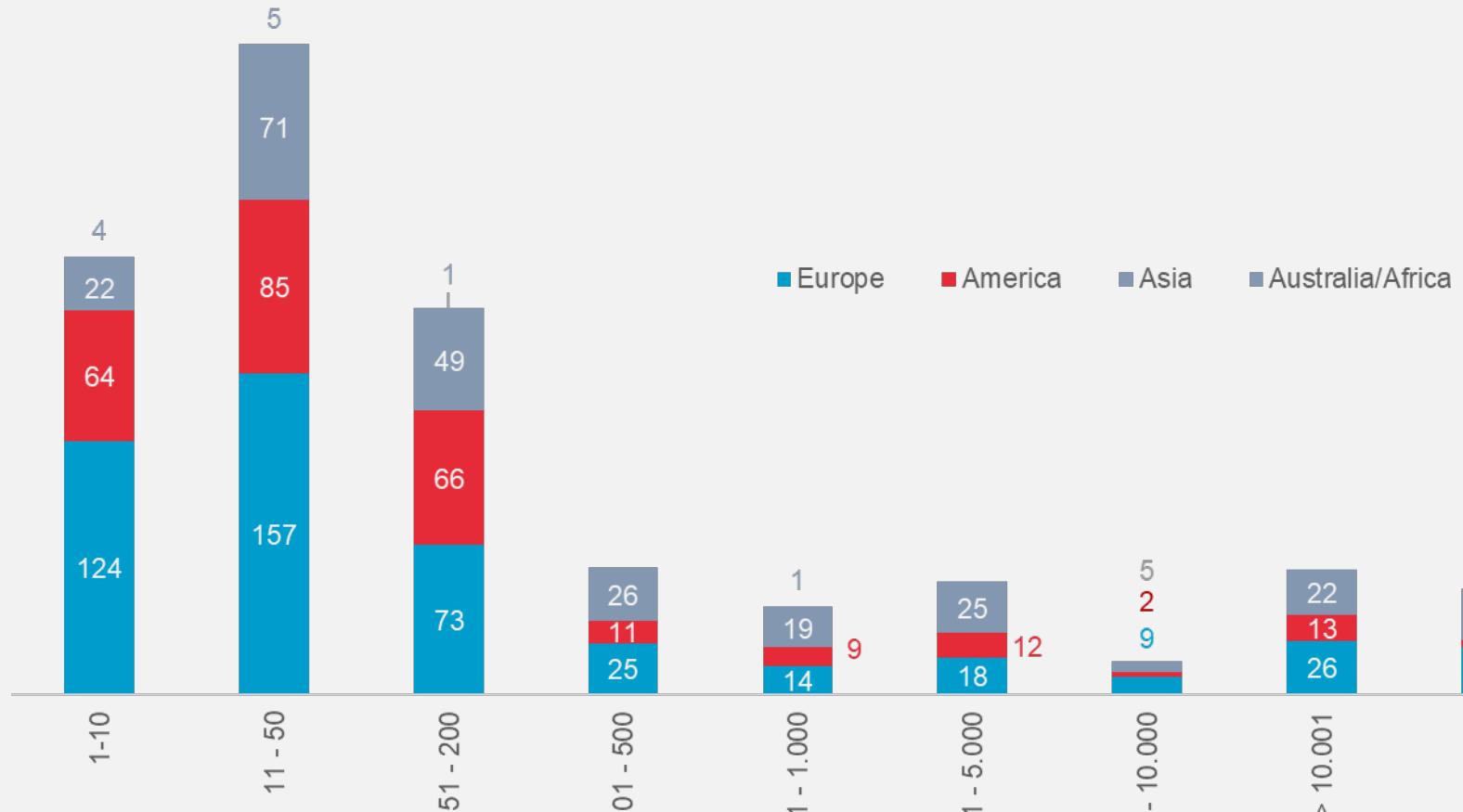
Number of service robot suppliers by region and age - consumer applications



Source: World Robotics 2022

80% of service robot supplier are small-medium sized enterprises (SME with <=500 employees)

Number of service robot manufacturers by business size
(number of employees)



Source: World Robotics 2022

Outlook

- Lack of skilled staff/
Demographic change
- New business models:
Robots-as-a-Service
- Technology advances and AI are opening up new use cases and improves performance in existing ones



Thank you for your attention.

IFR International Federation of Robotics
c/o VDMA Robotics + Automation
60528 Frankfurt Main, Germany



+49 69 6603 1502



secretariat@ifr.org



<https://ifr.org/>



@IFR_Robots



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