

INDUSTRIAL AND SERVICE ROBOTICS: STATE OF THE ART AND FUTURE TRENDS

**Robot, salute e benessere. L'impatto dell'automazione industriale 4.0 sul lavoro nelle fabbriche.
Milano, 7 novembre 2018**

**Arturo Baroncelli
Past President IFR
SIRI Board Member**

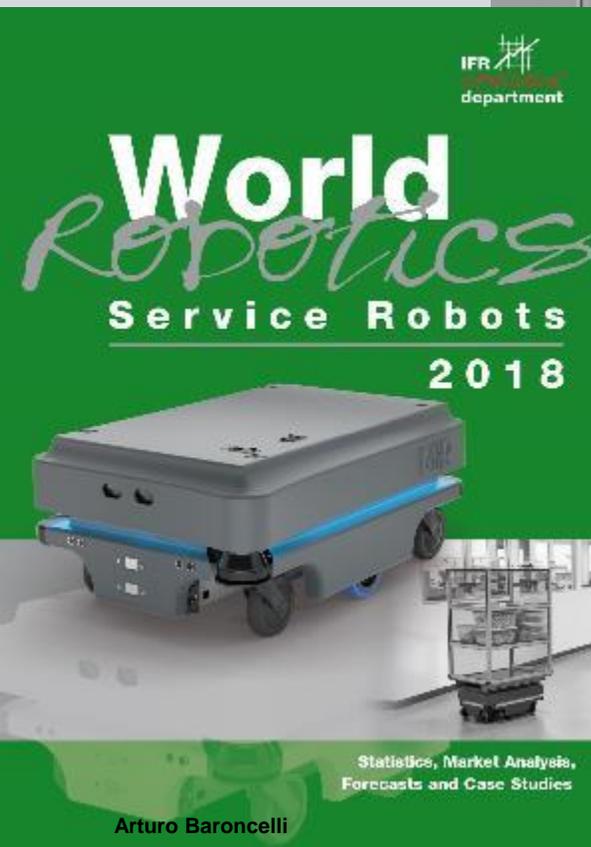
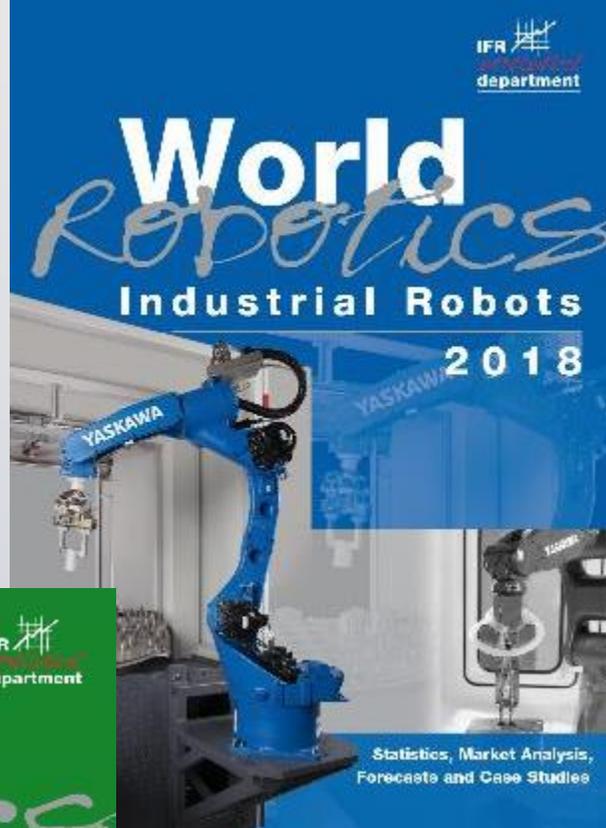
Agenda

World Robotics 2018 Industrial Robots

- Review 2017 and forecast 2018-2021
- Main markets – customers - trends
- Robot density

World Robotics 2018 Service Robots

- Professional Service Robots
- Personal/Domestic Service Robots



International Federation of Robotics – Representing the global robotics industry

- **Robotics turnover 2017: \$48 billion**
- **More than 50 members:**
 - National robot associations
 - R&D institutes
 - Robot suppliers
 - Integrators
- **Sponsor of the annual International Symposium on Robotics (ISR)**
- **Co-sponsor of the IERA Award**
- **Primary resource for world-wide data on use of robotics – IFR Statistical Department**



World Robotics

Industrial Robots 2018



Statistics, Market Analysis,
Forecasts and Case Studies

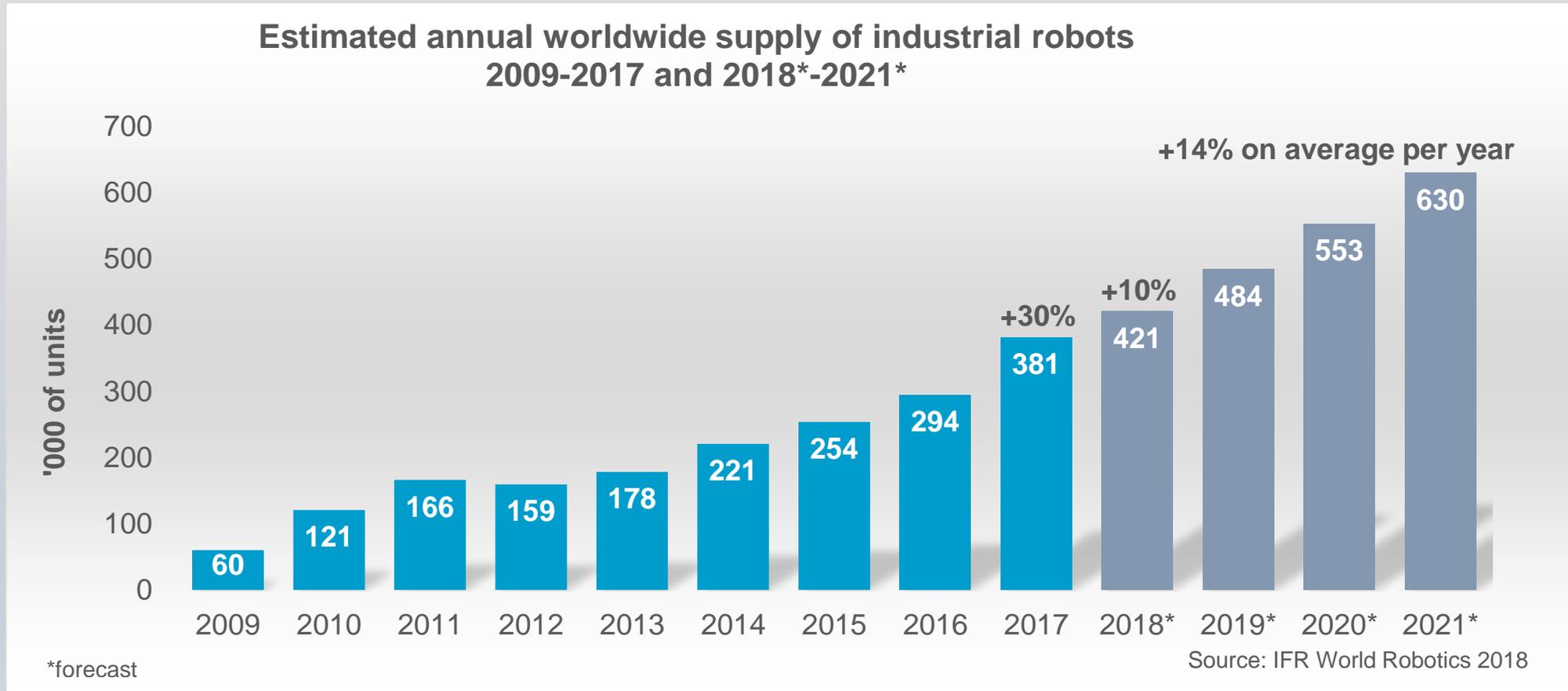
Records, records

2017: 381,300 units, +30%

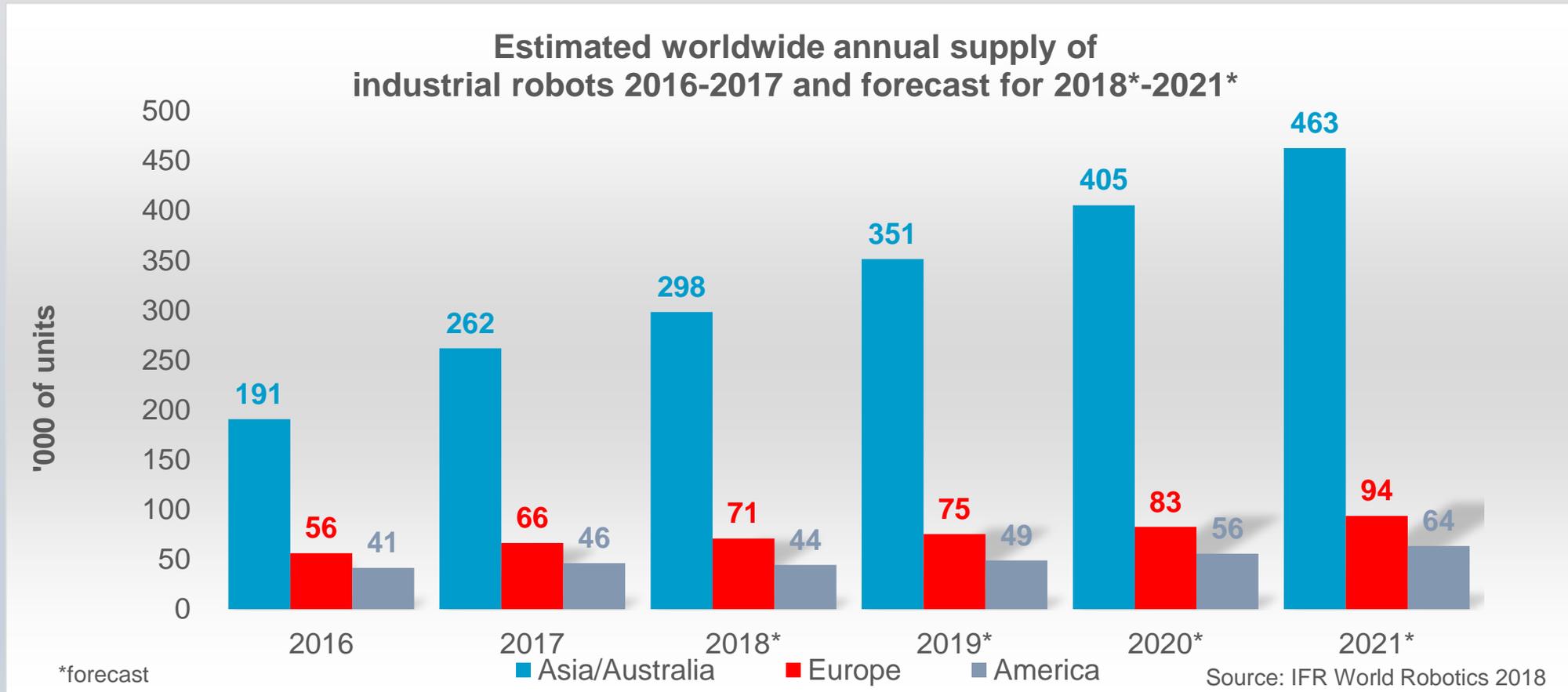
2018: 421,000 units, +10%

2021: 630,000 units,
+14% on average per year

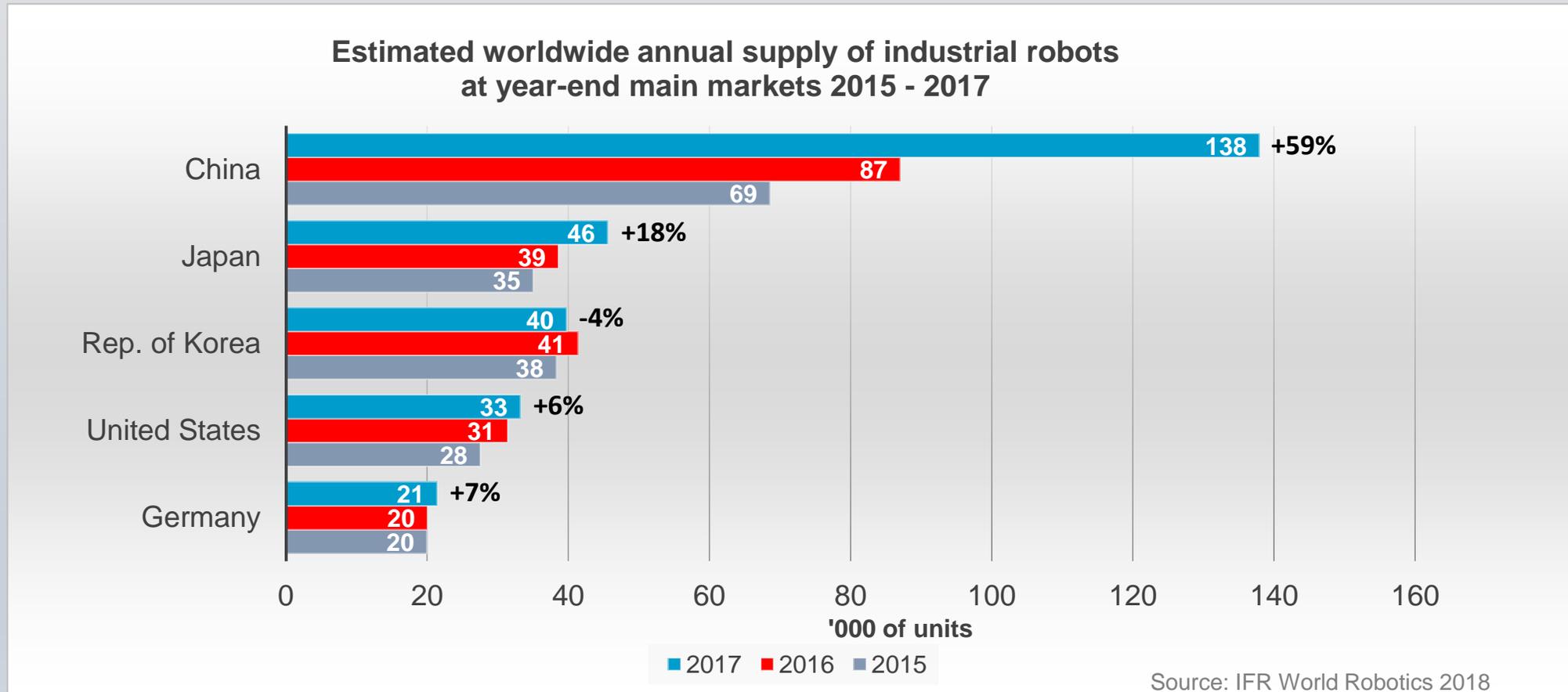
Continued record sales since 2013



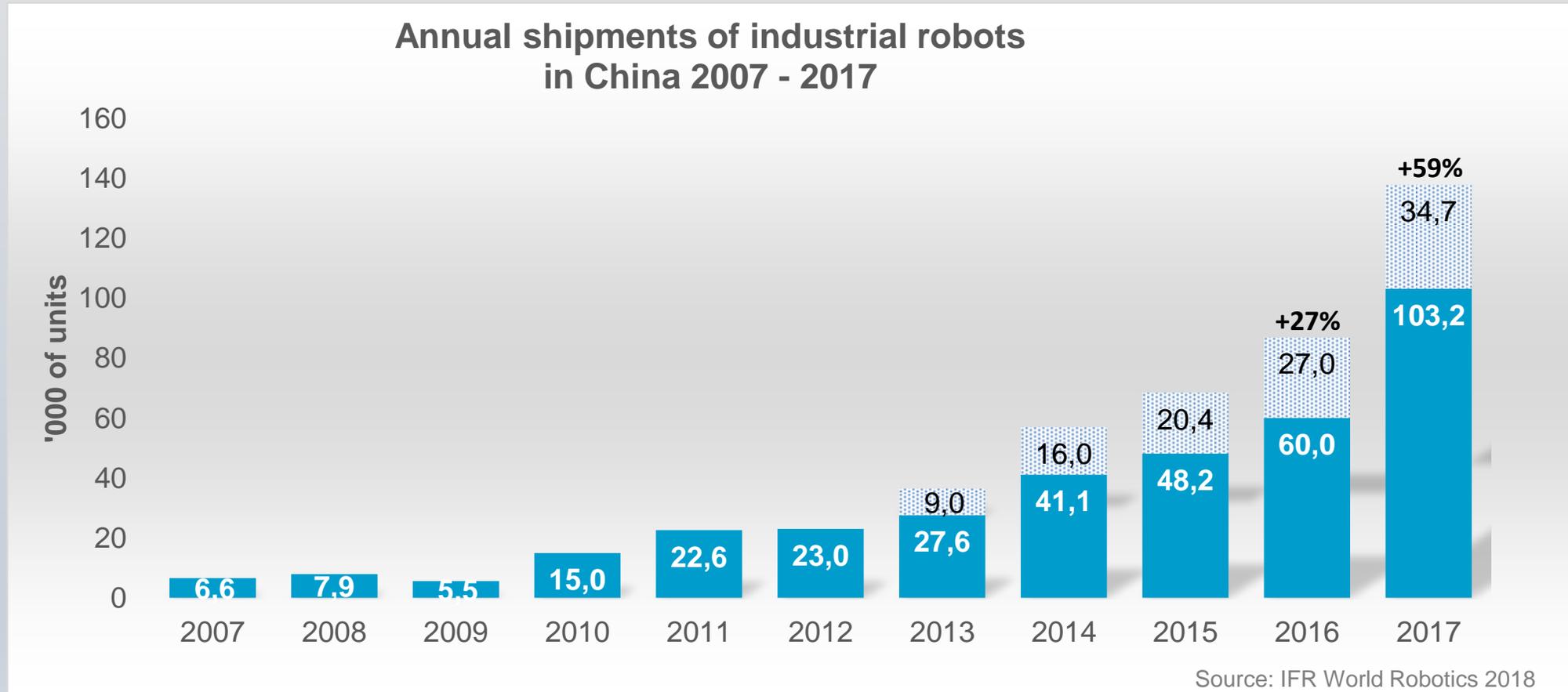
Emerging region Asia



Top 5 countries represent 73% of total sales in 2017



China: Strong increase of robots sales of foreign companies



Italia: oltre 50 anni di sviluppo nella Robotica

- Il ruolo dell' Italia è stato fondamentale
- Tra i migliori specialisti del mondo.
- Eccellenze sia a livello industriale che accademico.



Italy: double digit growth 2017 vs 2016 (IFR data) and first half 2018 vs first half 2017 (SIRI UCIMU data)

IFR data 2017 vs 2016 2015



SIRI UCIMU data 1st half 2018 vs 1st half 2017

Stima del mercato di robot articolati, scara, cinematica parallela, cartesiani, collaborativi e altri.

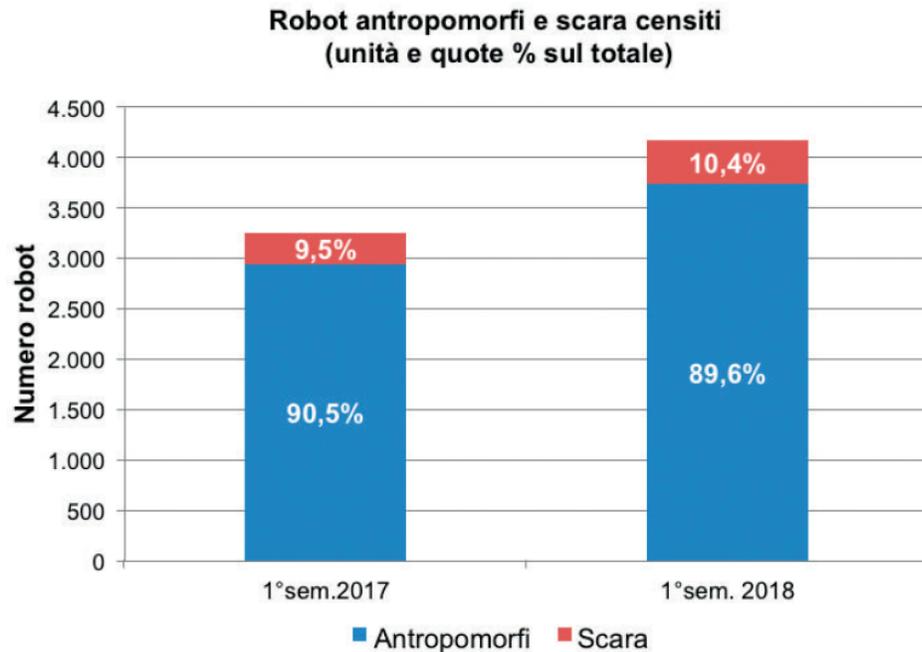
	1° sem. 2017	1° sem. 2018	Var. 18/17
TOTALE ROBOT ORDINATI			
<i>Stima del mercato</i>	3.870	5.072	31,1%

Italy: focus on first half 2108 vs first half 2017

Source: Deformazione - PubliTec Ottobre 2018 on SIRI UCIMU data

Stima del mercato di robot articolati, scara, cinematica parallela, cartesiani, collaborativi e altri.

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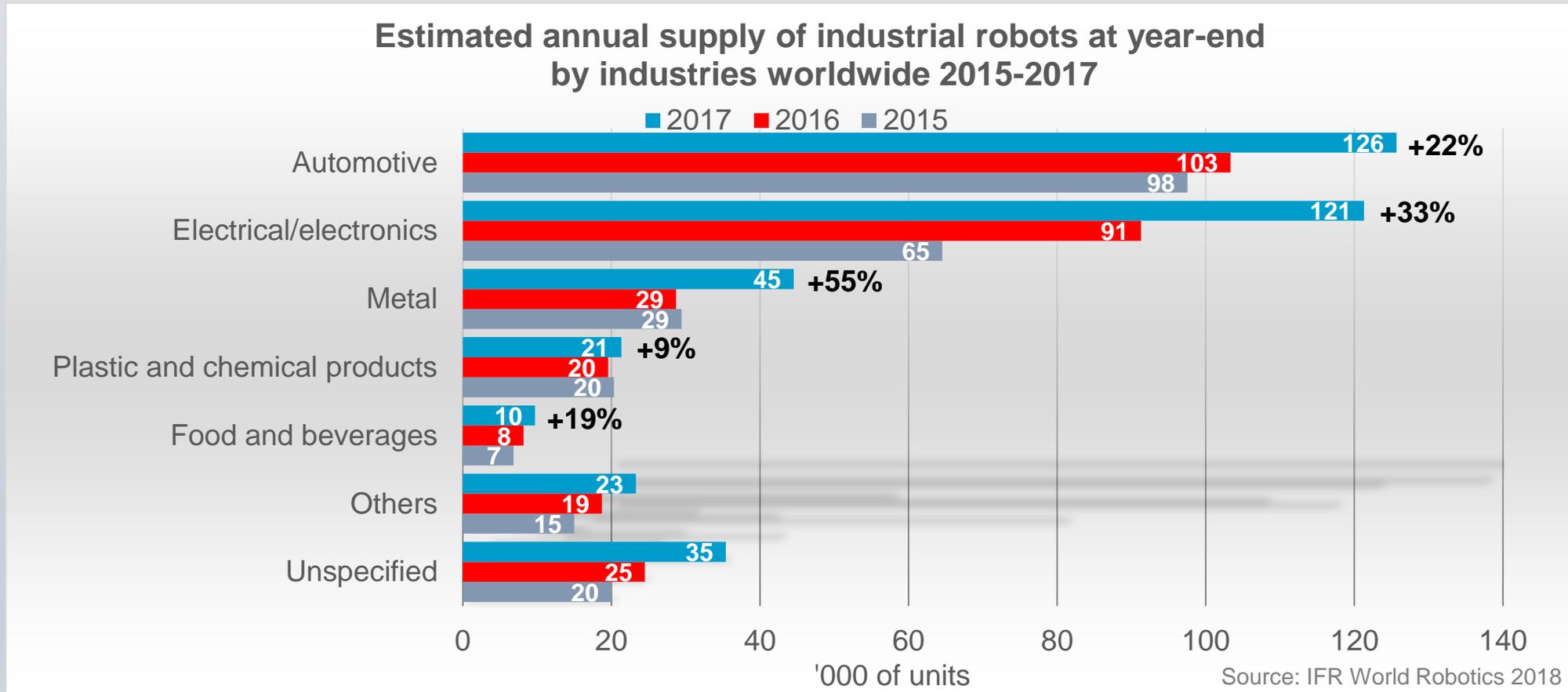


7. Numero di Robot censiti (indagine SIRI/UCIMU).

7. Number of registered Robots (SIRI/UCIMU survey).

	1° sem. 2017	1° sem. 2018	Var. 18/17
Robot ordinati direttamente	794	906	14,1%
Auto	54	59	9,3%
Tier1/Tier2	231	283	22,5%
General Industry	509	564	10,8%
Robot ordinati tramite terzi	2.462	3.264	32,6%
Automotive/ Tier 1/ Tier 2	309	431	39,5%
General Industry	2.153	2.833	31,6%
TOTALE ROBOT ORDINATI	3.256	4.170	28,1%
Robot per AW	145	243	67,6%
Robot per SW	58	72	24,1%
Robot per MH	1.675	2.024	20,8%
Robot asservimento MU	359	480	33,7%
Robot in fonderia	244	236	-3,3%
Robot per appl. di processo/sbavatura	72	109	51,4%
Robot per verniciatura	38	45	18,4%
Robot per pallettizzazione	328	622	89,6%
Robot di montaggio	322	339	5,3%
Robot altri	15	0	n.s.
TOTALE ROBOT ORDINATI	3.256	4.170	28,1%

Main drivers of the growth 2017: automotive, electronics, metal



Key Drivers for Automation more relevant than ever

Shift to high mix/low volume production

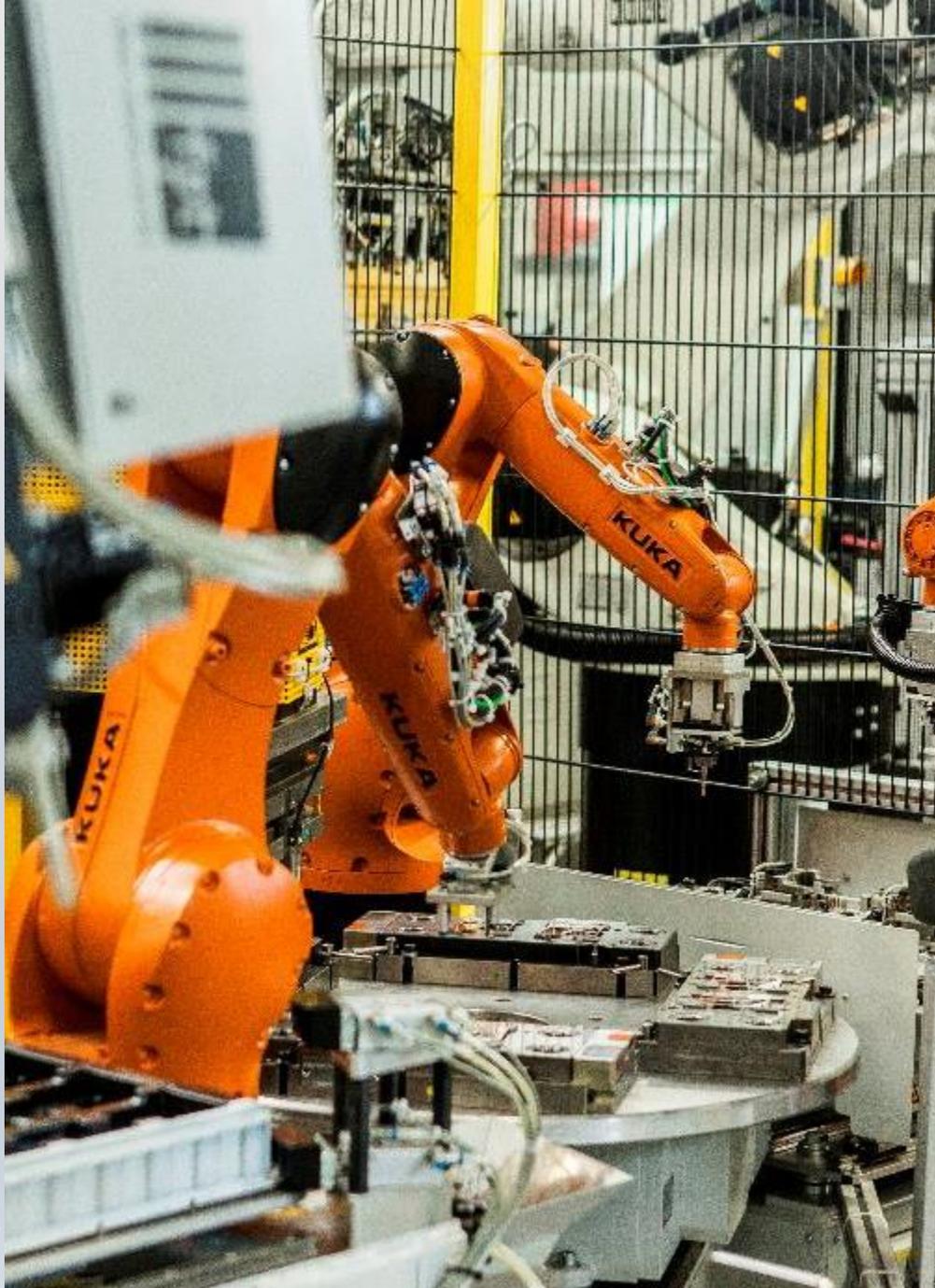
Global competitiveness

Digitalization of manufacturing – Industry 4.0

Growing consumer markets

Energy efficiency-driven technology shifts

Regionalized production



Main customer: automotive industry

Transition from Internal Combustion Engines (ICE) to electric vehicles/hybrids

Increased complexity

Customization – increasing mix requires more flexible production

Automation of final assembly

Automotive parts suppliers – more SME's will use robots



Main customer: electrical/electronics industry

**Continuously increasing demand for
batteries, chips and displays**

Short life cycles of electronic products

**High turnover of people with associated
labor shortages**

Increasing degree of robot adoption

**Higher quality demands on manufacturing
process**



Robot sales will increase in all other industries

Metal industries – more flexibility and cost efficiency

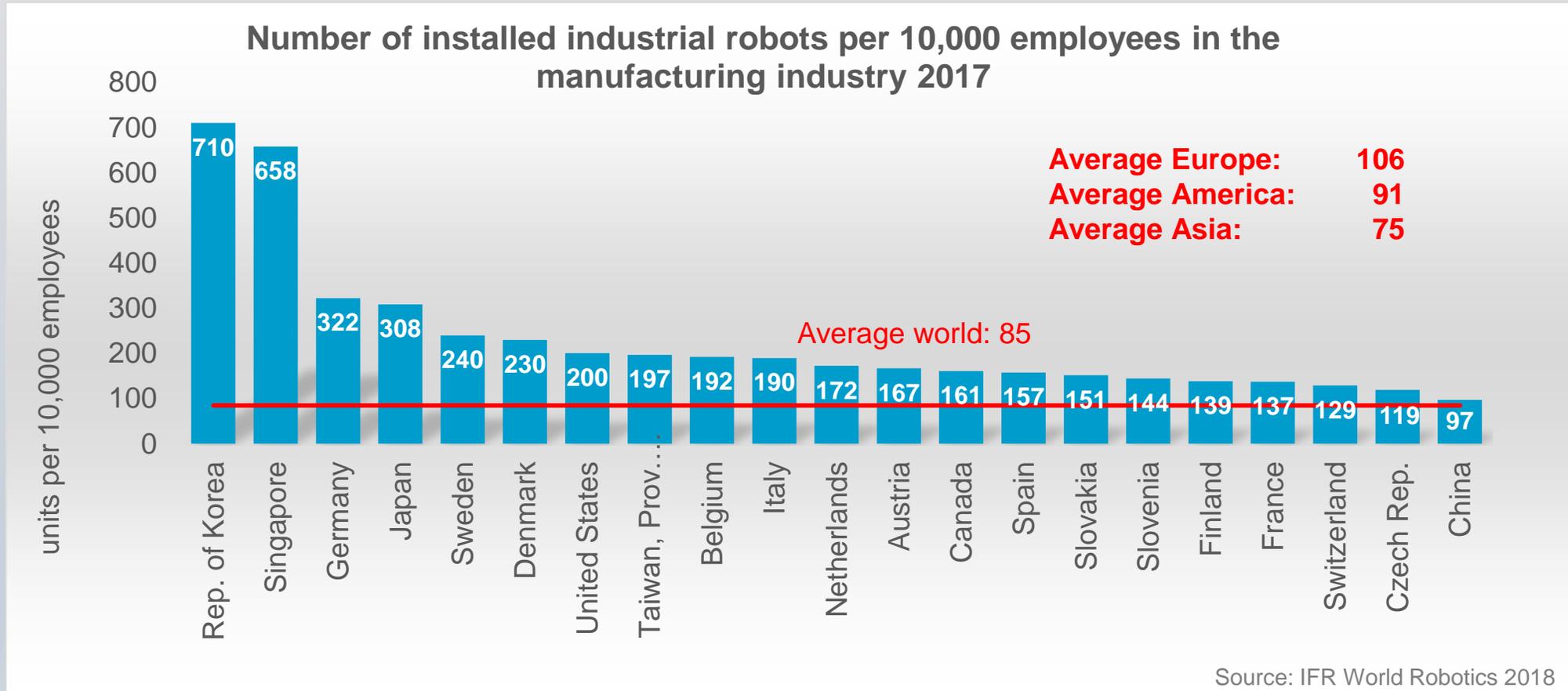
Rubber and plastics industry – more integrated manufacturing concepts

Food and beverage industry – shift to even shorter production runs

Pharmaceutical industry - improving productivity without sacrificing quality



Highest robot density in Korea - lowest average in Asia



Technological Developments expanding Robot Adoption

Today

- More intelligent components, e.g. Smart Grippers
- Greater connectivity, e.g. “Plug & Play” interfaces and Cloud Computing
- Easier to Use, e.g. “Programming by Demonstration”

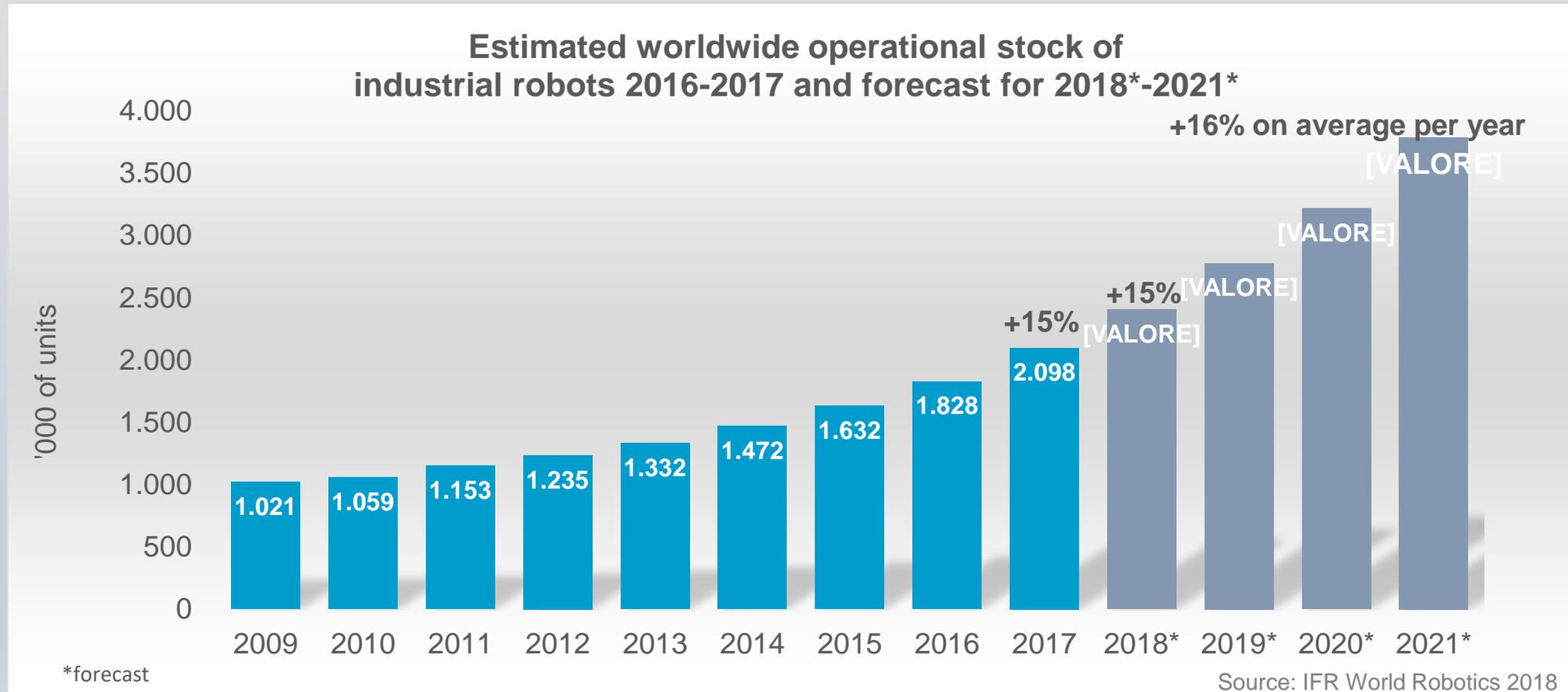
Tomorrow

“Machine learning” enables robots

- to learn by trial-and-error or by video demonstration.
- to self-optimize.
- to communicate with other machines to improve entire processes.

New business models, e.g. Robotics as a Service (RaaS)

2021 : 3.8 Million Industrial Robots in the World's Factories



World Robotics Service Robots 2018



Statistics, Market Analysis,
Forecasts and Case Studies

Professional Service Robots have entered our daily lives

Value of sales

2017: US\$ 6.6 bn, +39%

2018: US\$ 8.7 bn, +33%

2019-2021: US\$ 37 bn, +19% (CAGR)

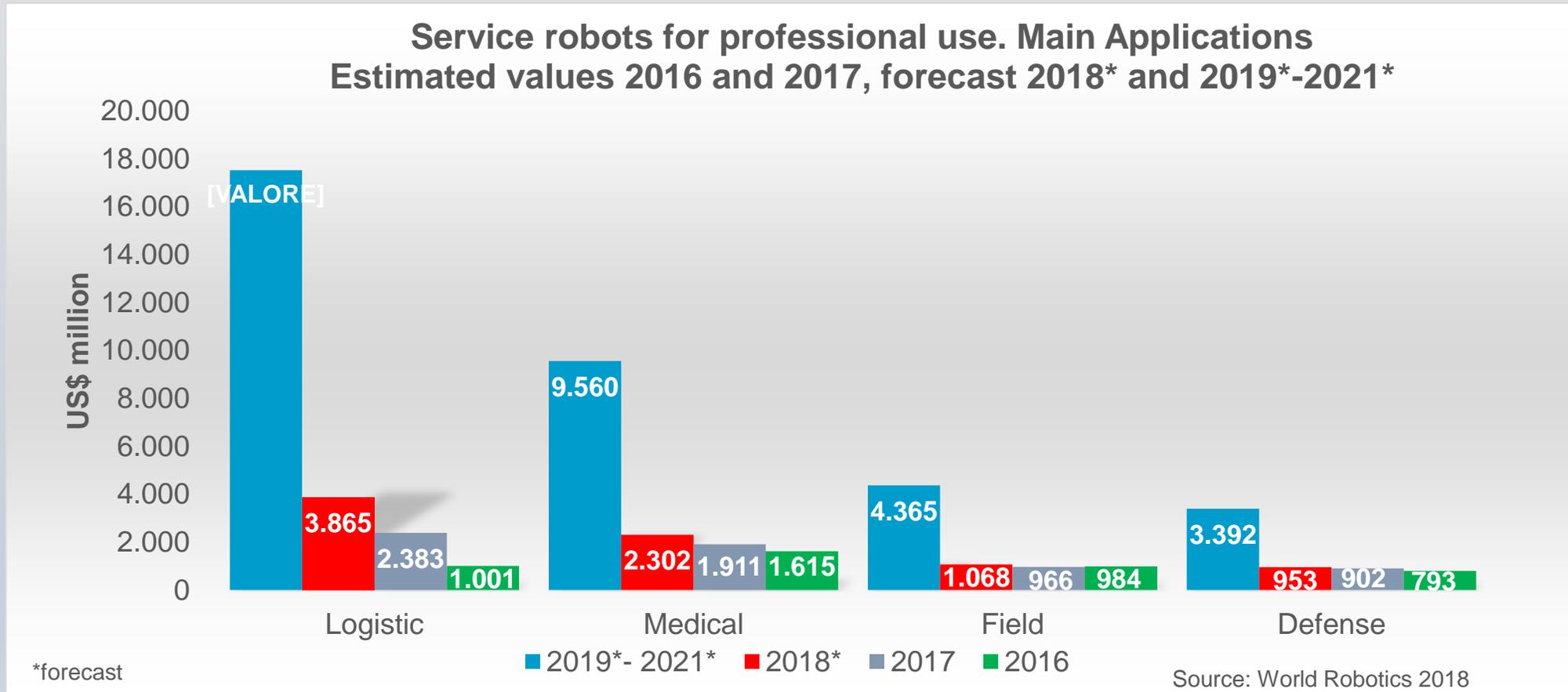
Unit sales:

2017: 109,500 units, +85%

2018: 165,300 units, +32%

2019-2021: 736,600 units, +21% (CAGR)

Professional Service robots: Main drivers of the value growth are logistic systems



AGVs in factories, warehouses, logistic centers, hospitals...

69,000 units installed in 2017, 162% more than in 2016

- 6,700 units in manufacturing
- 62,200 units in warehouses, logistic centers, hospitals ...

2018:

115,000 units, 66% higher than in 2017

2019-2021:

485,000 units, +18% on average per year



Medical robots – most valuable service robots: US\$ 1.9 billion in 2017

- 2017: 2,900 units, +75%
- 2018: 4,400 units, +49%
- 2019-2021: 22,100 units, +27% (CAGR)

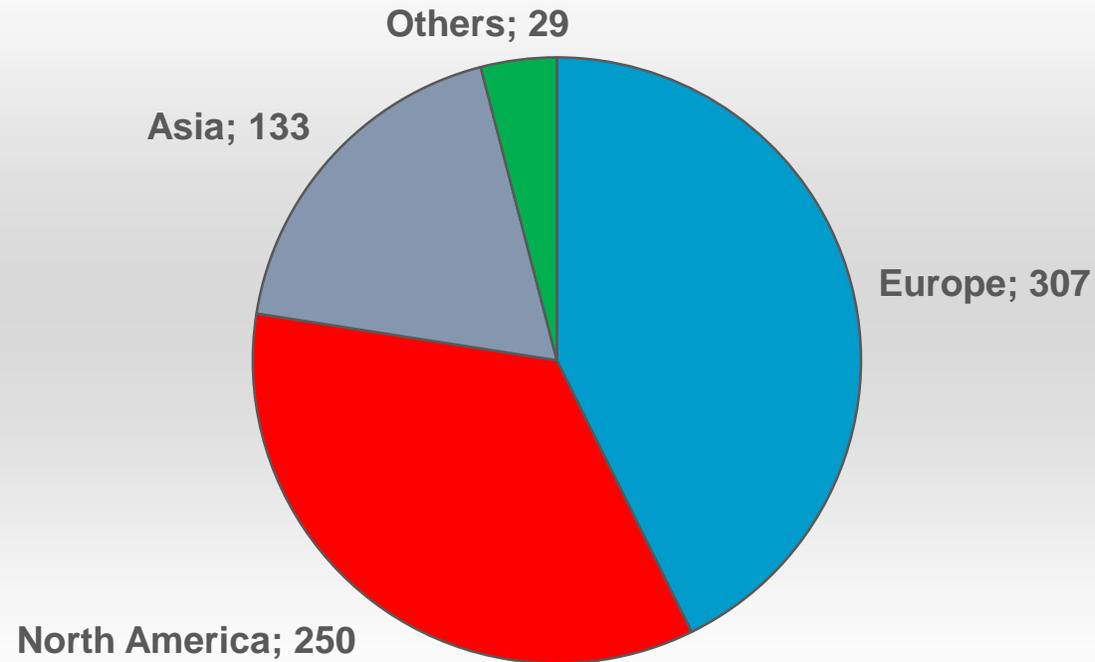
Field robots – mostly milking robots

- 5,400 milking robots in 2017, slight increase
- Still low number but high increase: agricultural robots – 520 units in 2017 up from 190 units
- 2018: 7,200 field robots, +17%
- 2019-2021: 32,700, +22% (CAGR)



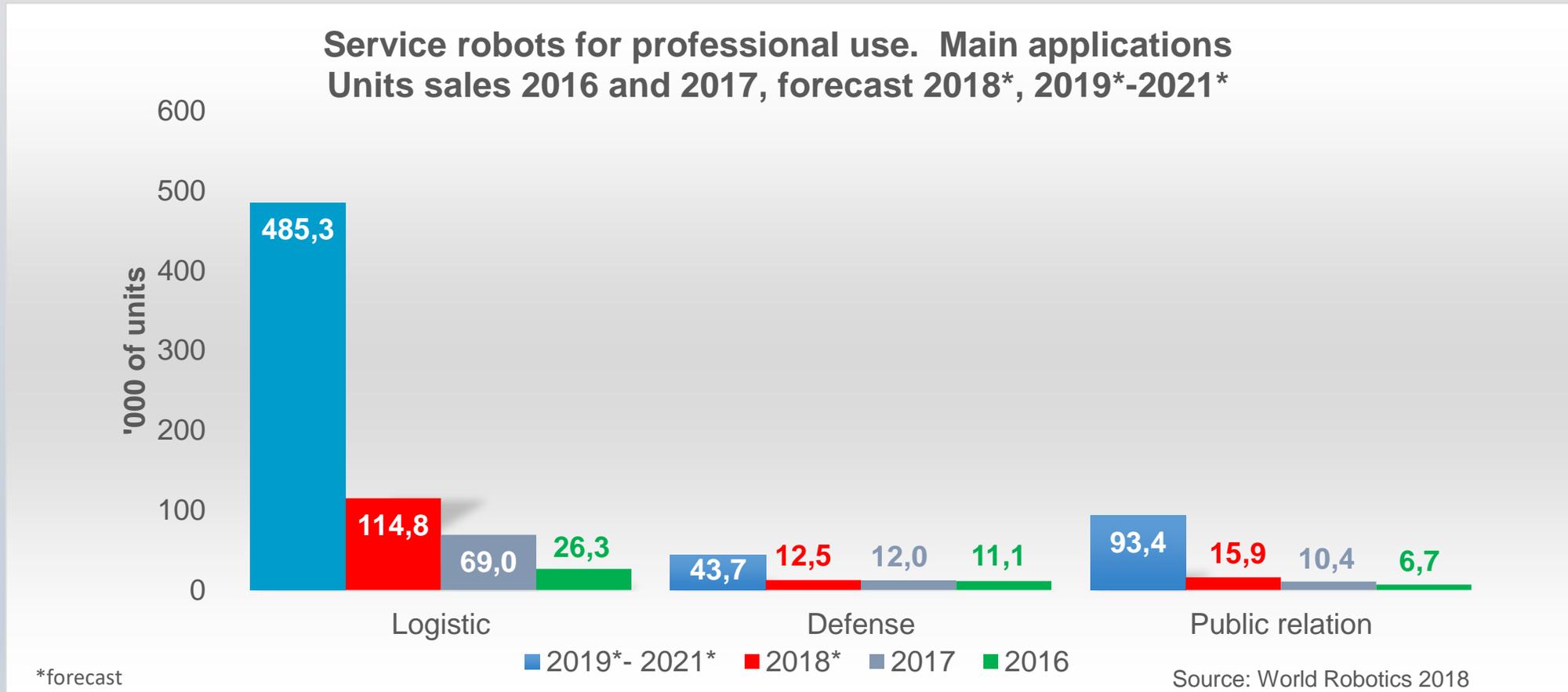
More than 700 service robot companies identified

Number of service robot manufacturers of all types
(professional and personal/domestic use) by region of origin

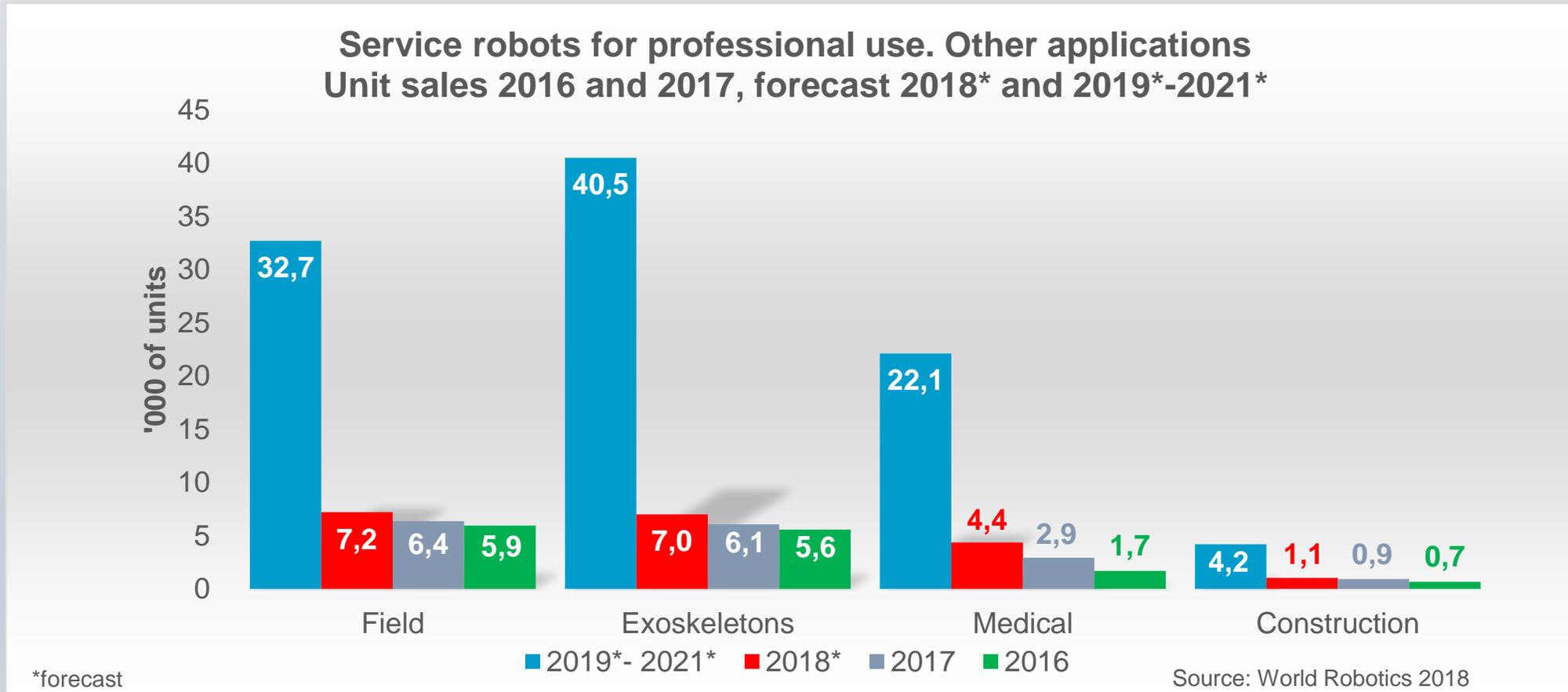


Source: World Robotics 2018

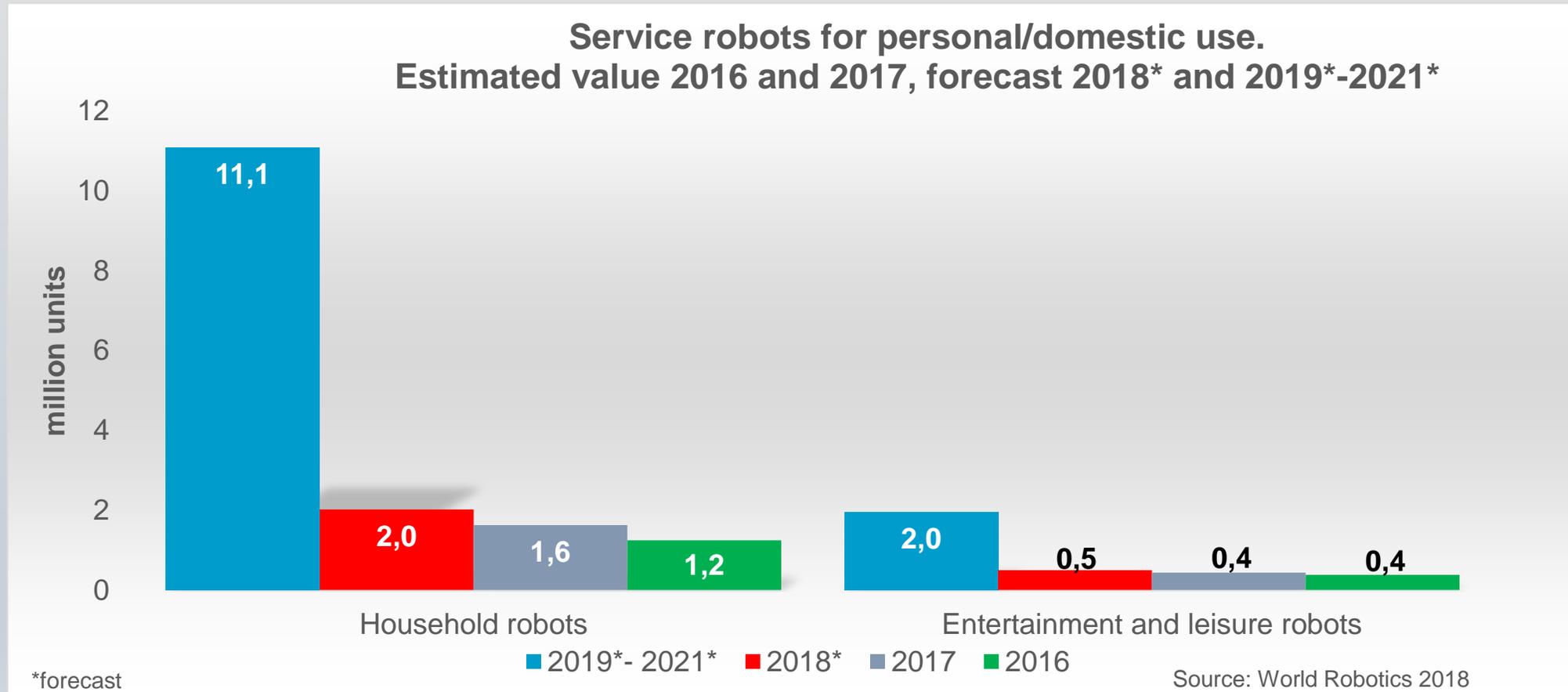
Logistic systems are also the drivers of the growth in units



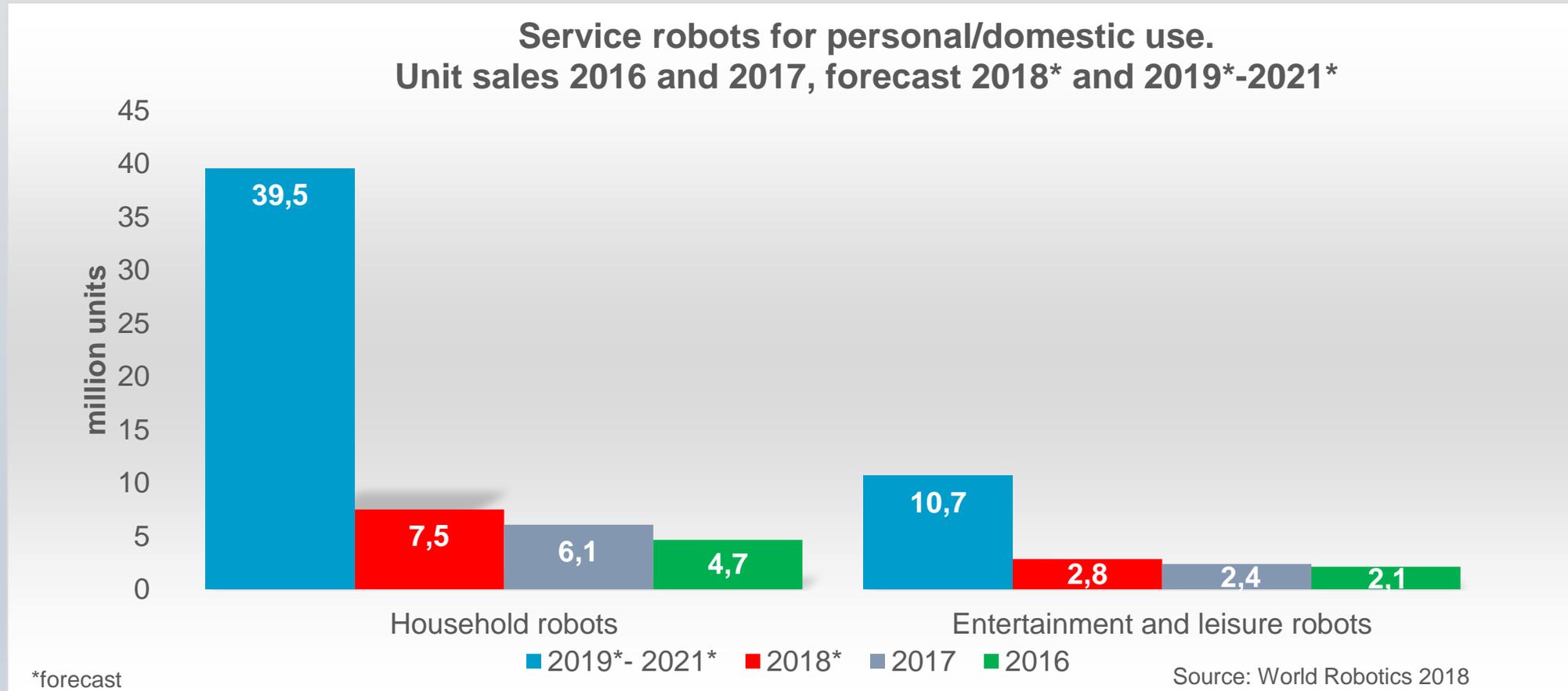
High potential for exoskeletons



Vacuuming and floor cleaning robots are most established personal/domestic service robots

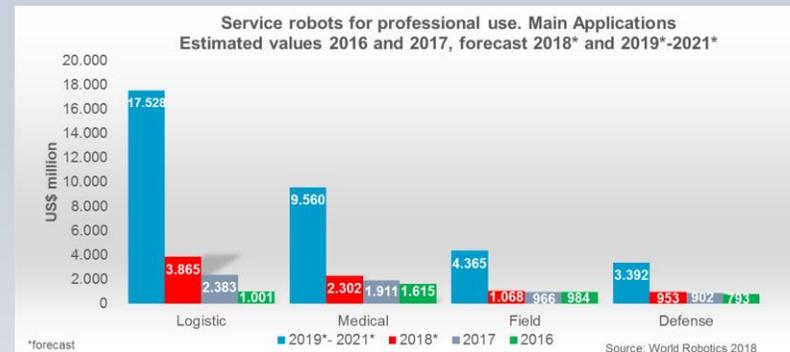
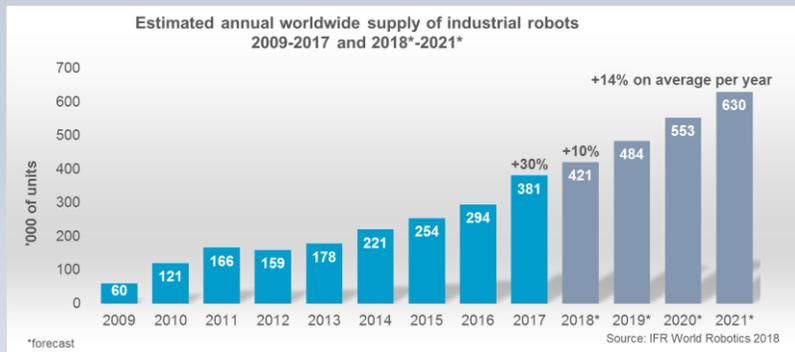
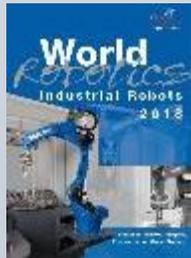


2017: 8.5 million units, +25% - considerable increase expected



Conclusions

- Both Industrial & Service Robotics grew and are expected to grow in the next years at double digit rate
- Industrial Robots show an impressive growth in 2017 +30%. Automotive, Electrical industry main markets but also others rapidly growing. China reconfirms to be the greatest market. Present technological drivers: intelligent components, connectivity, ease to use. Future trends: machine learning, new business models
- Service robots grew and are expected to grow in all segments both professional and personal. Remarkable growths in logistic, exoskeleton and cleaning robots
- Italy reconfirms its outstanding position in Robotics and shows impressive growth both in 2017 and half year 2018



Italia: oltre 50 anni di sviluppo nella Robotica



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Grazie !

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