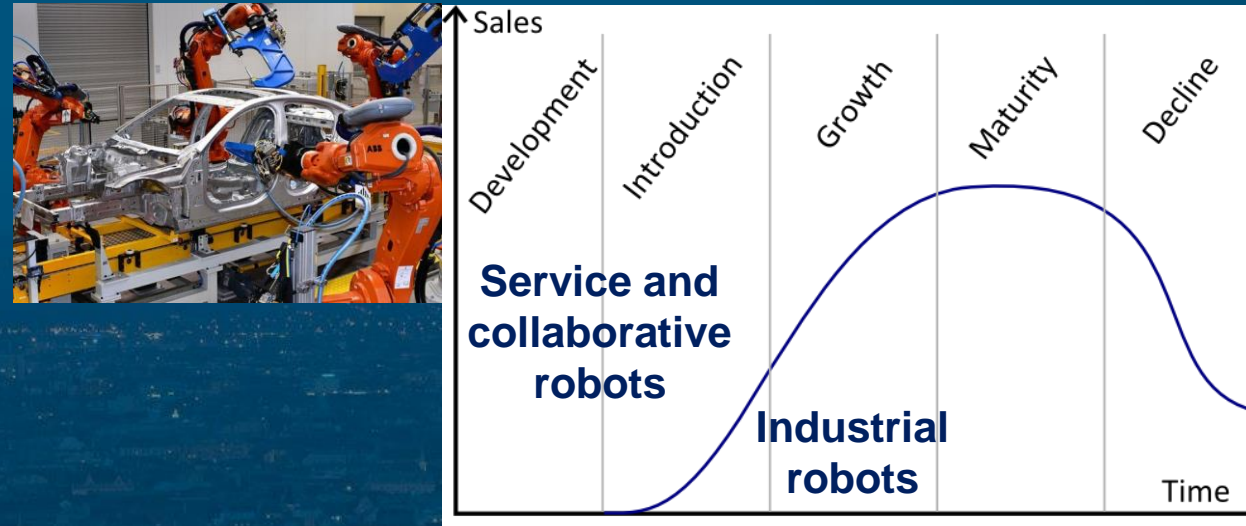


A tale of two robots...



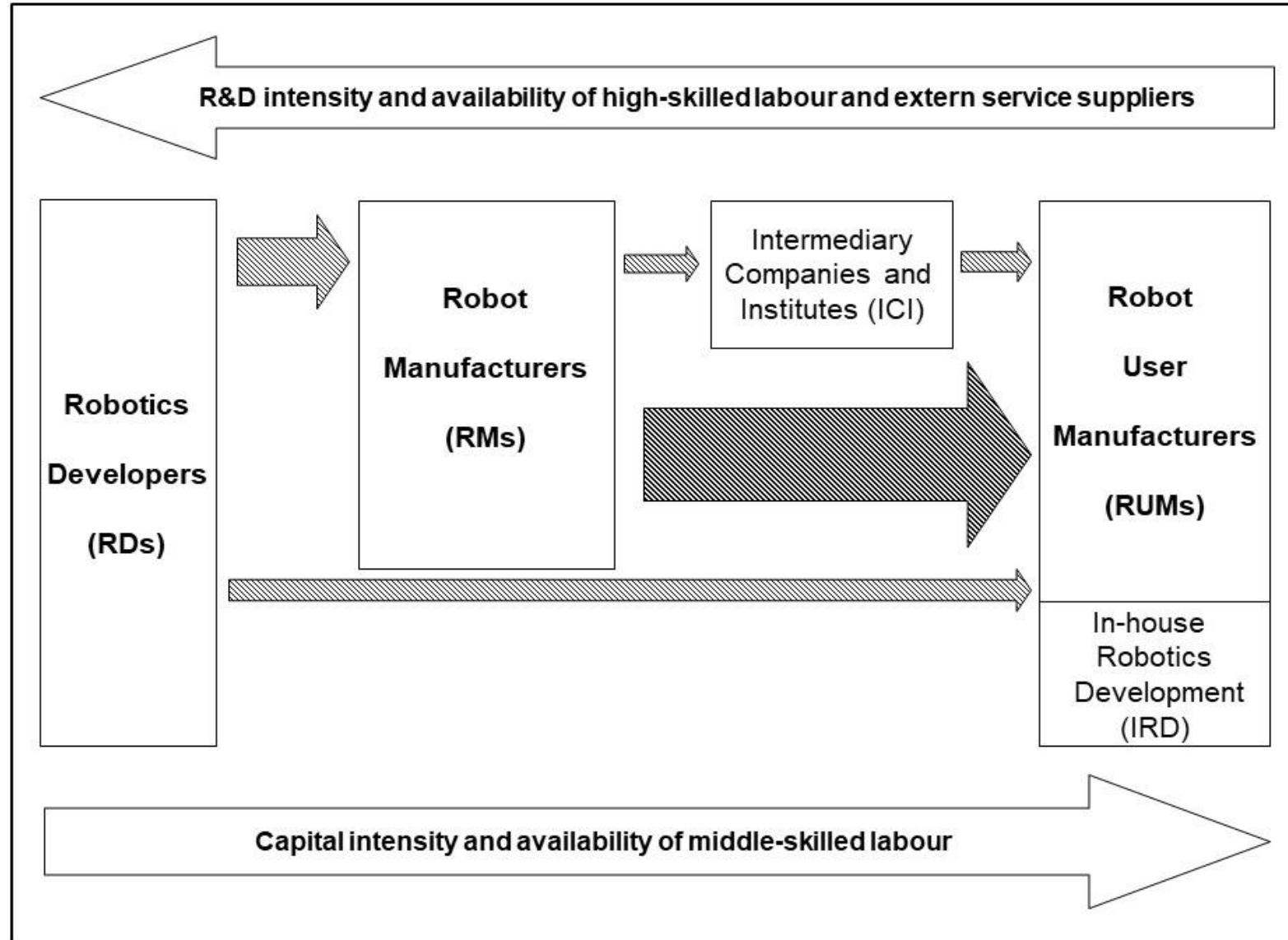
Industrial robots

- ⇒ Limited scope of application areas, but mass deployment
- ⇒ Mass manufacturing production in few industries
- ⇒ Dominated by global companies and large economies

Service & collaborative robots

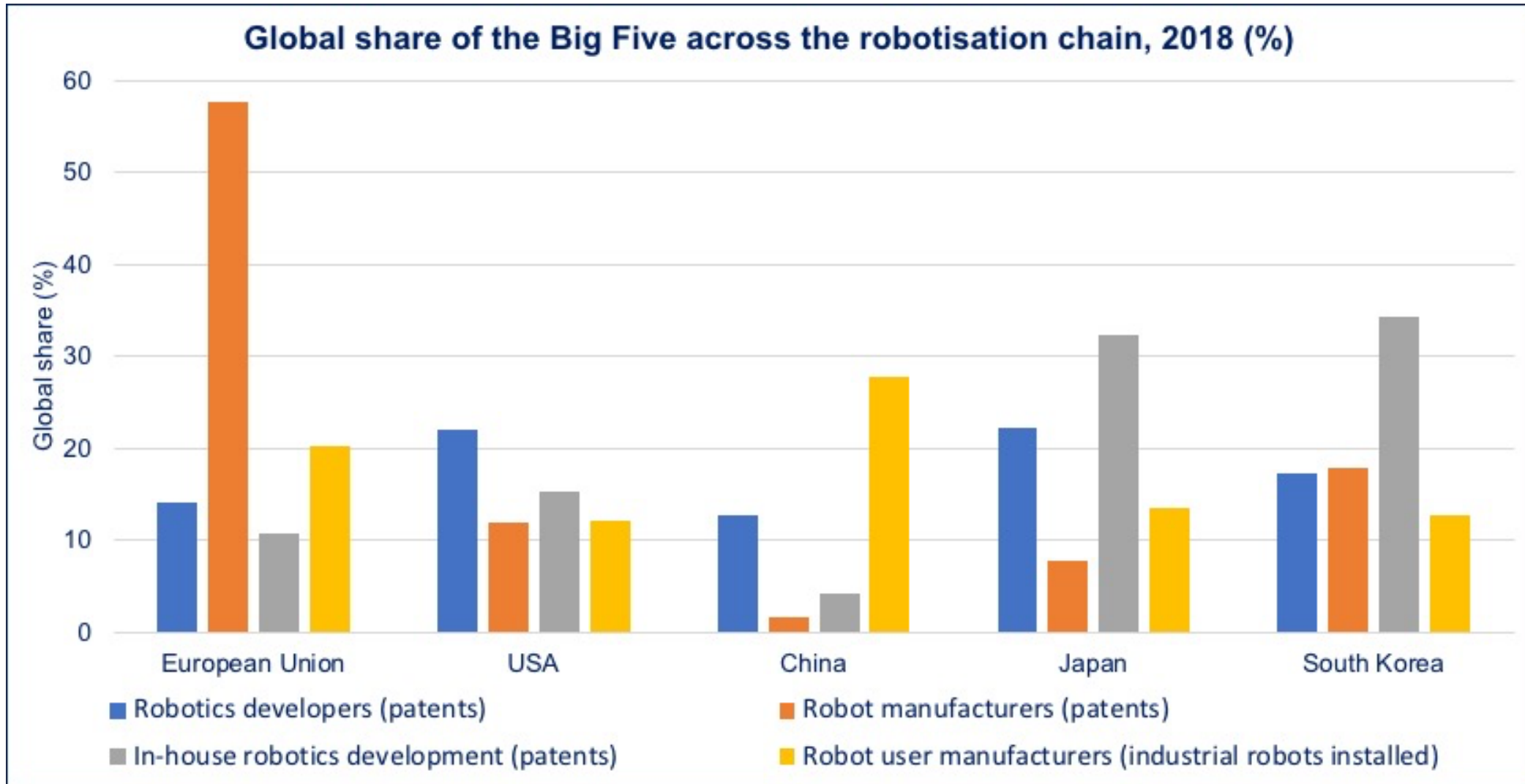
- ⇒ Widening scope of application areas, but low deployment
- ⇒ Locally embedded in services or small-scale industrial settings
- ⇒ Driven by the dynamics of global companies and startups

Robots in the cages – Global position of Europe



Source: Cséfalvay, Z. and Gkotsis, P. (2020) Robotisation race in Europe: the robotisation chain approach. Economics of Innovation and New Technology, Fig. 1, <https://www.tandfonline.com/doi/full/10.1080/10438599.2020.1849968>

Robots in the cages – Global position of Europe



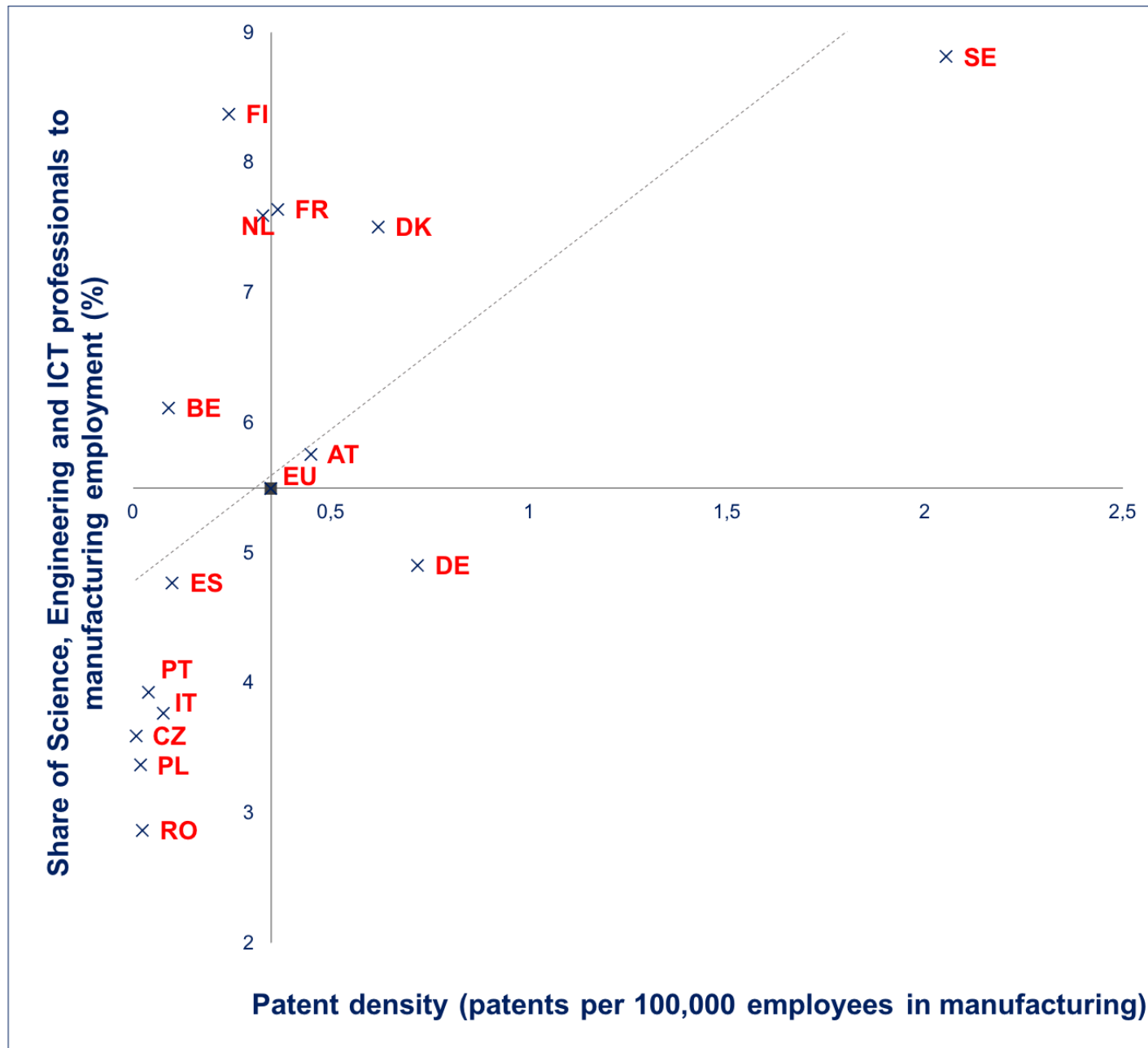
Source: Cséfalvay, Z. and Gkotsis, P. (2020) Global race for robotisation – Looking at the entire robotisation chain. JRC Technical Report, Seville, JRC121184, Tab. 2,

<https://ec.europa.eu/jrc/en/publication/global-race-robotisation-looking-entire-robotisation-chain>

Robots in the cages – Disparities within Europe

Patent density in Europe and the share of Science, Engineering and ICT professionals to manufacturing employment

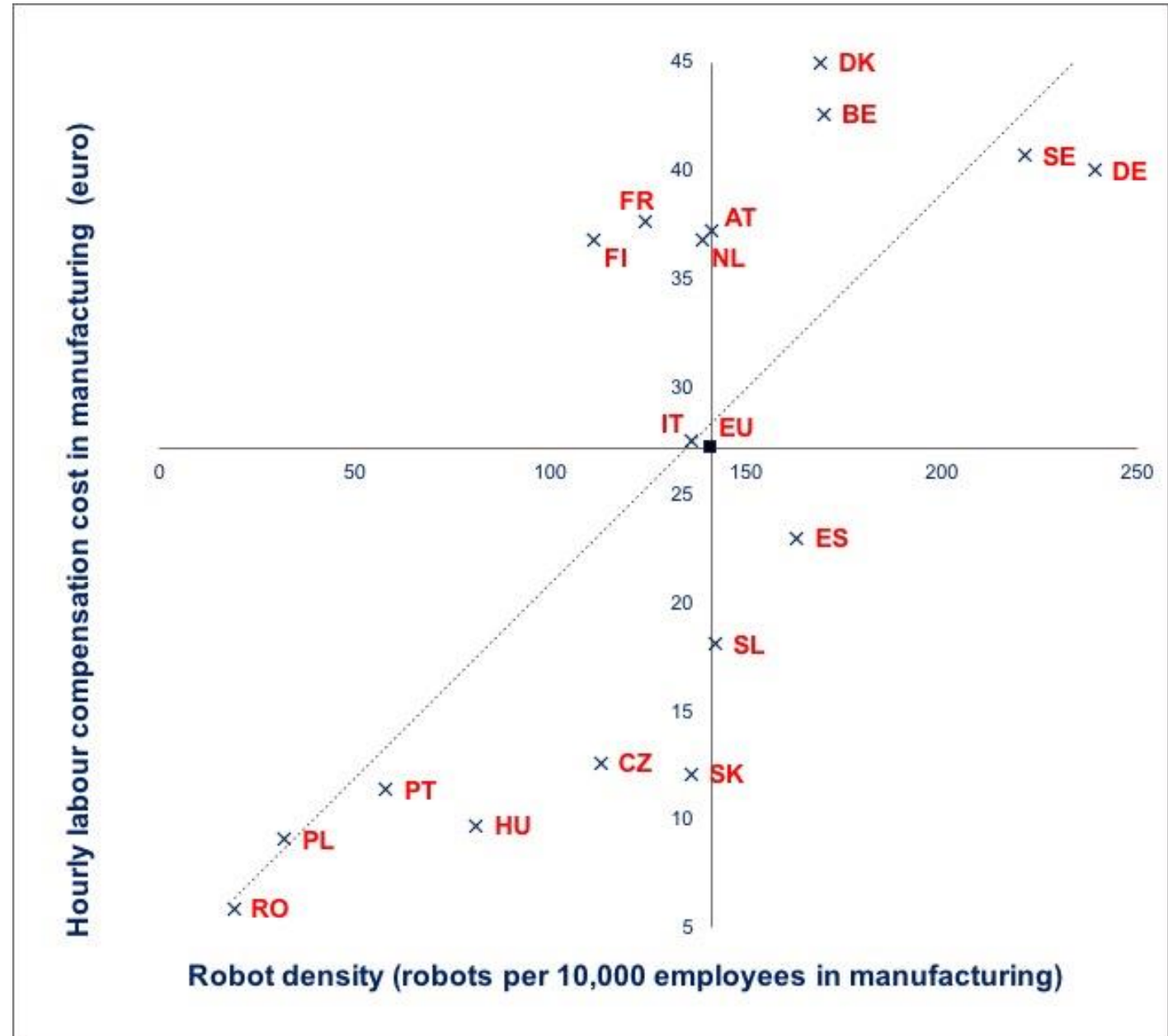
(average = 0.35 patents per 100,000 employees in manufacturing, average = 5.5% of Science, Engineering and ICT professionals to manufacturing employment, Pearson's $r = 0.6207$, p -value = 0.014).



Robots in the cages – Disparities within Europe

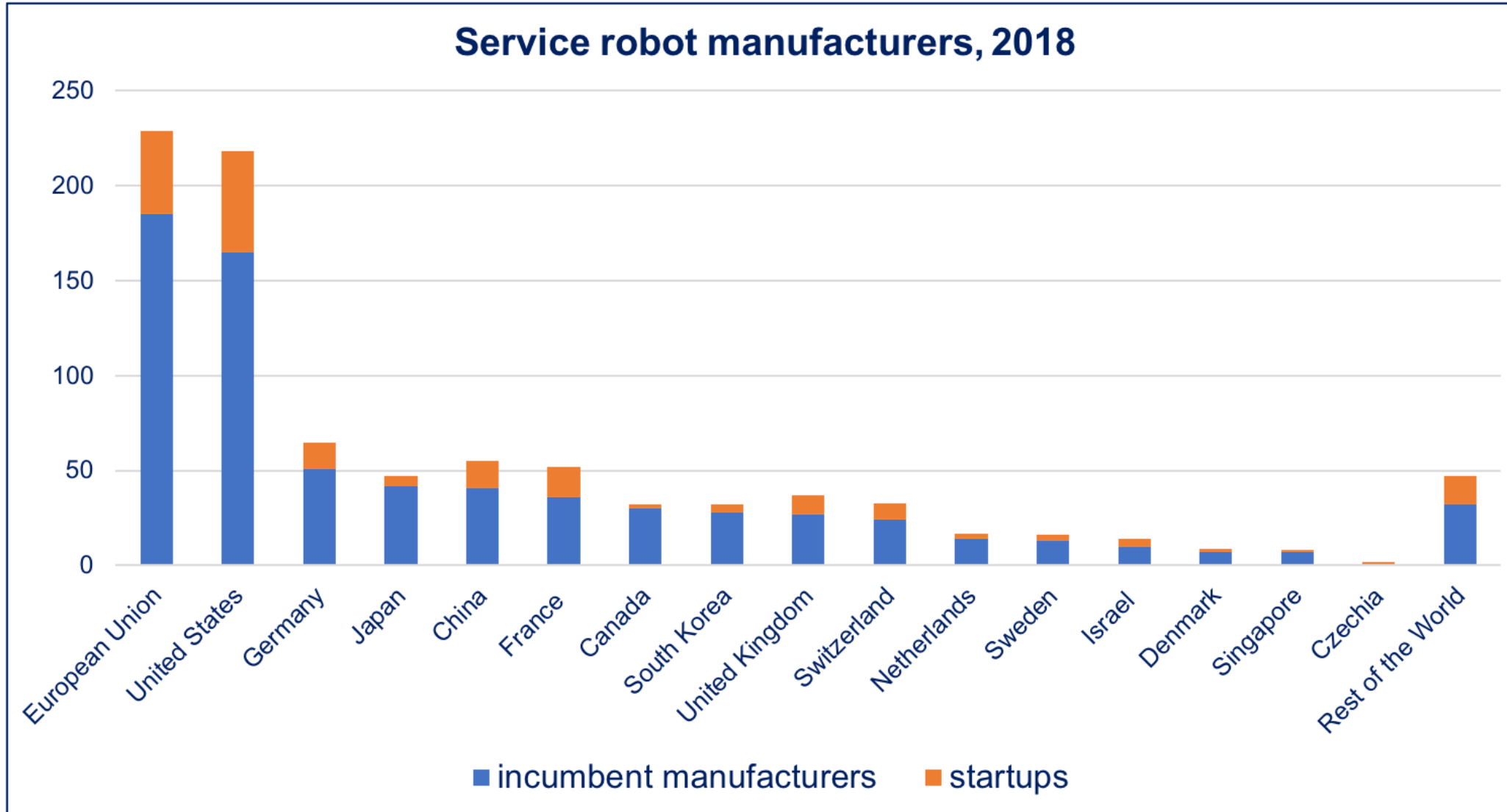
Robot density and hourly labour compensation costs in manufacturing, selected European countries, 2018

(average robot density = 141 robots per 10,000 employees in manufacturing, average labour cost in manufacturing: 27.3 euros, Pearson's $r = 0.7528$, p -value = 0.00032).



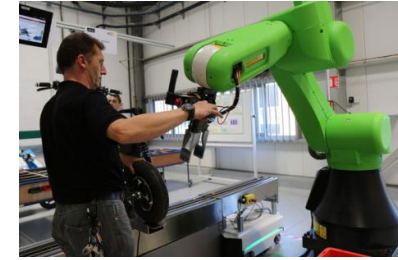
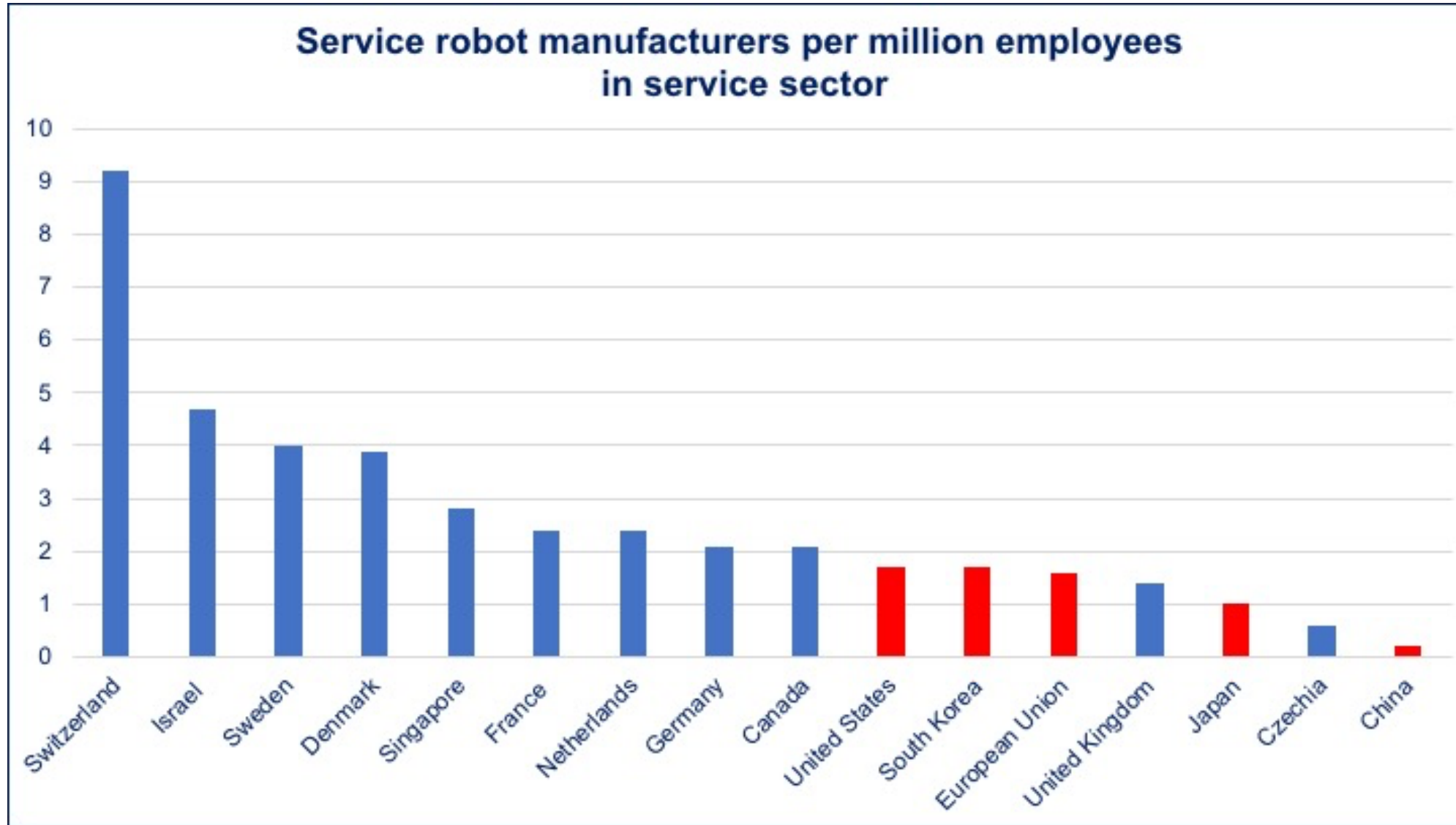
Source: Cséfalvay, Z. and Gkotsis, P. (2020) Robotisation race in Europe: the robotisation chain approach. Economics of Innovation and New Technology, Fig. 7, <https://www.tandfonline.com/doi/full/10.1080/10438599.2020.1849968>

Robots are moving out of the cages – Global position of Europe



Source: author's calculation based on data of IFR (2019) for service robot manufacturers

Robots are moving out of the cages – Global position of Europe



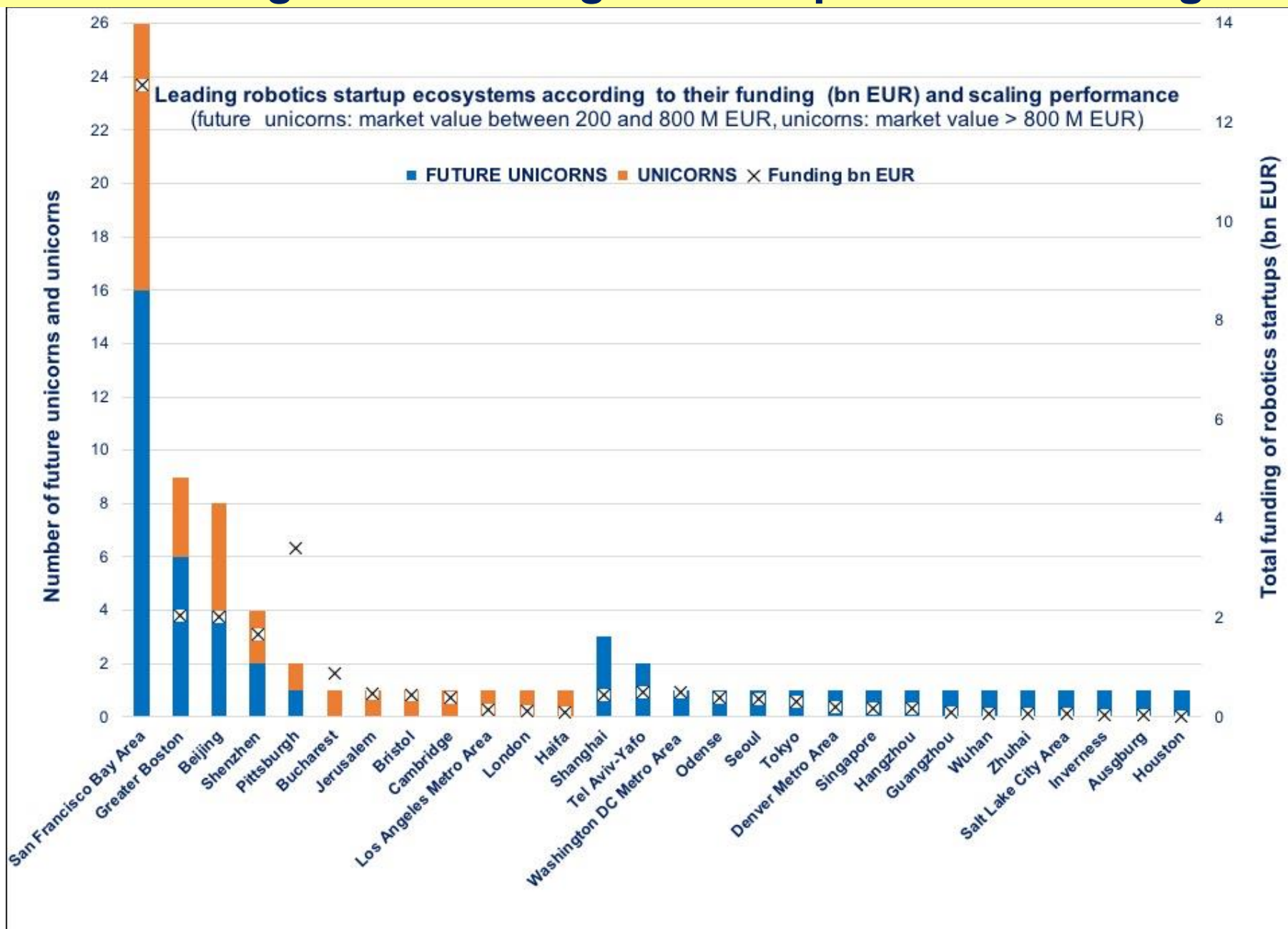
Source: author's calculation based on data of IFR (2019) for service robot manufacturers and ILOSTAT for employment

Robots are moving out of the cages – Europe faces a funding gap

	Robotics			Artificial Intelligence		
	number of startups	total funding of startups (M EUR)	funding (M EUR) per 1bn USD GDP	number of startups	total funding of startups (M EUR)	funding (M EUR) per 1bn USD GDP
United States	1,401	21,355	1.00	4,973	77,772	3.64
China	242	4,672	0.33	457	18,860	1.31
European Union	1,354	2,735	0.18	3,612	11,048	0.71
<i>Germany</i>	196	362	0.09	667	2,677	0.70
<i>France</i>	219	409	0.15	689	3,119	1.15
<i>Denmark</i>	165	458	1.32	101	246	0.71
<i>Sweden</i>	46	80	0.15	168	369	0.69
<i>Netherlands</i>	148	89	0.10	439	1,058	1.16
<i>Czechia</i>	12	0.2	0.00	37	129	0.52
Japan	58	314	0.06	94	730	0.14
South Korea	32	373	0.23	98	579	0.35
United Kingdom	201	1,101	0.39	1,117	7,329	2.59
Switzerland	96	161	0.23	183	943	1.34
Canada	89	220	0.13	393	2,199	1.27
Israel	120	1,130	2.86	937	6,116	15.48
Singapore	30	162	0.44	165	1,140	3.06
Rest of the World	375	317	N/A	1,820	1,954	N/A
World Total	3,998	32,540	0.37	13,849	128,670	1.44

Source: author's calculation based on data of Dealroom.co for startups, retrieved in May 2020, and World Bank for GDP, retrieved in October 2020

Robots are moving out of the cages – Europe faces a scaling challenge



Source: author's calculation based on data of Dealroom.co for startups, retrieved in May 2020

Policy challenges for Europe



Industrial robots

- ⇒ For highly robotised countries: **Trade-off** between the potential job losses in manufacturing and the strengthening of their industrial base and trade.
- ⇒ For less robotised countries: **Upgrading along the robotisation chain** and moving to job-generating parts of the robotisation chain
- ⇒ **Reshoring** of previously offshored production processes



Service & collaborative robots

- ⇒ **Stronger focus on robotics of the regionally targeted innovation and industry policies** (Industry 4.0, Smart Specialisation), or developing new and targeted instruments
- ⇒ Creating and **nurturing vibrant ecosystem for robotics startups** in order to tackle the persistent problem of their weak upscaling
- ⇒ Seizing the opportunity of a stronger involvement of the **public sector**