Unemployment through digitization?

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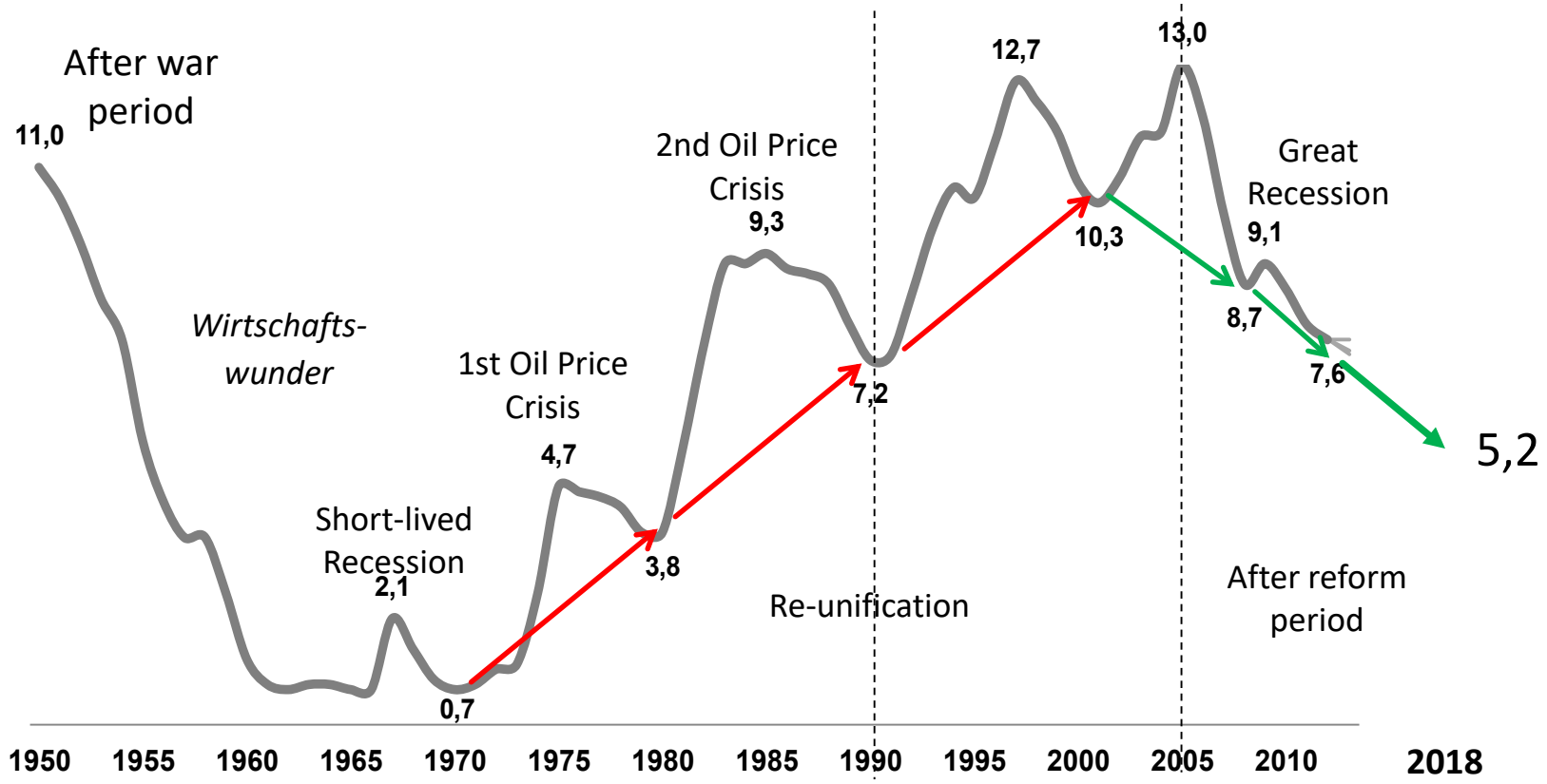
Some basic facts on the German labor market

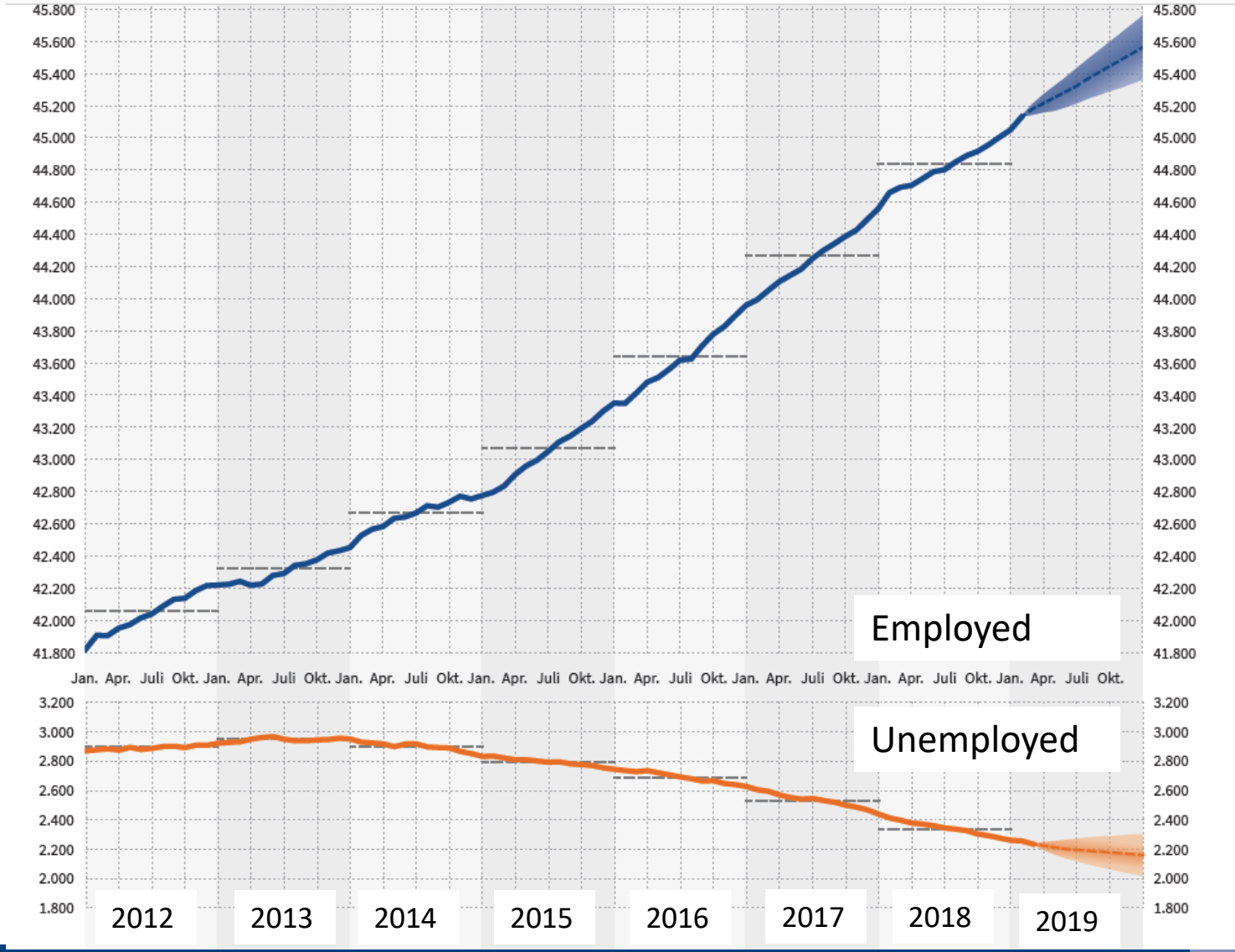
The broken trend in unemployment – on the path back to full employment?



Unemployment rate (in percent of civil labor force. Germany 1950 to 2018)

Source: German Federal Employment Agency; Statistic Department

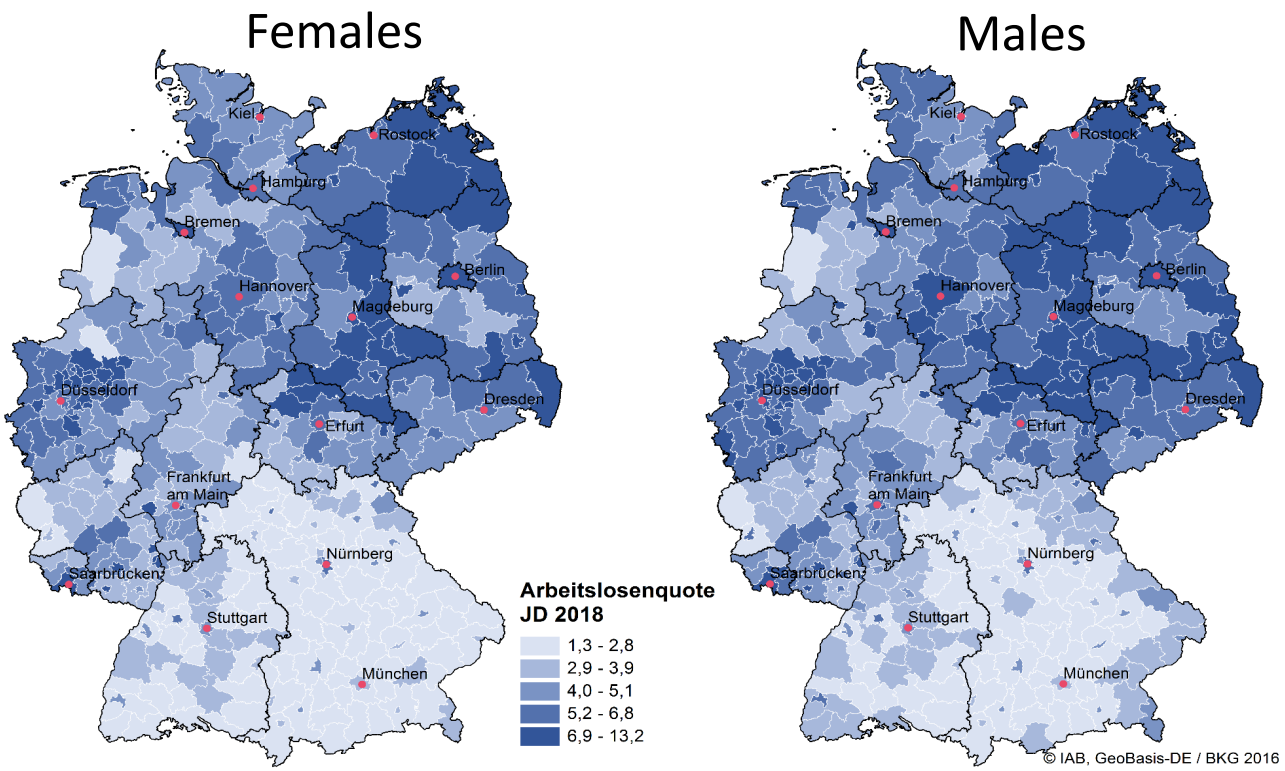
Short-term expectations: employment keeps on rising, unemployment falling



Source: IAB Kurzbericht 7-2019

Large regional disparities in unemployment rates

D: 5,0%
Ost: 6,4%
West: 4,6%



D: 5,4%
Ost: 7,3%
West: 5,0%

Quelle: Statistik der Bundesagentur für Arbeit; Berechnungen des IAB; Arbeitslosenquote bezogen auf alle zivilen Erwerbspersonen.

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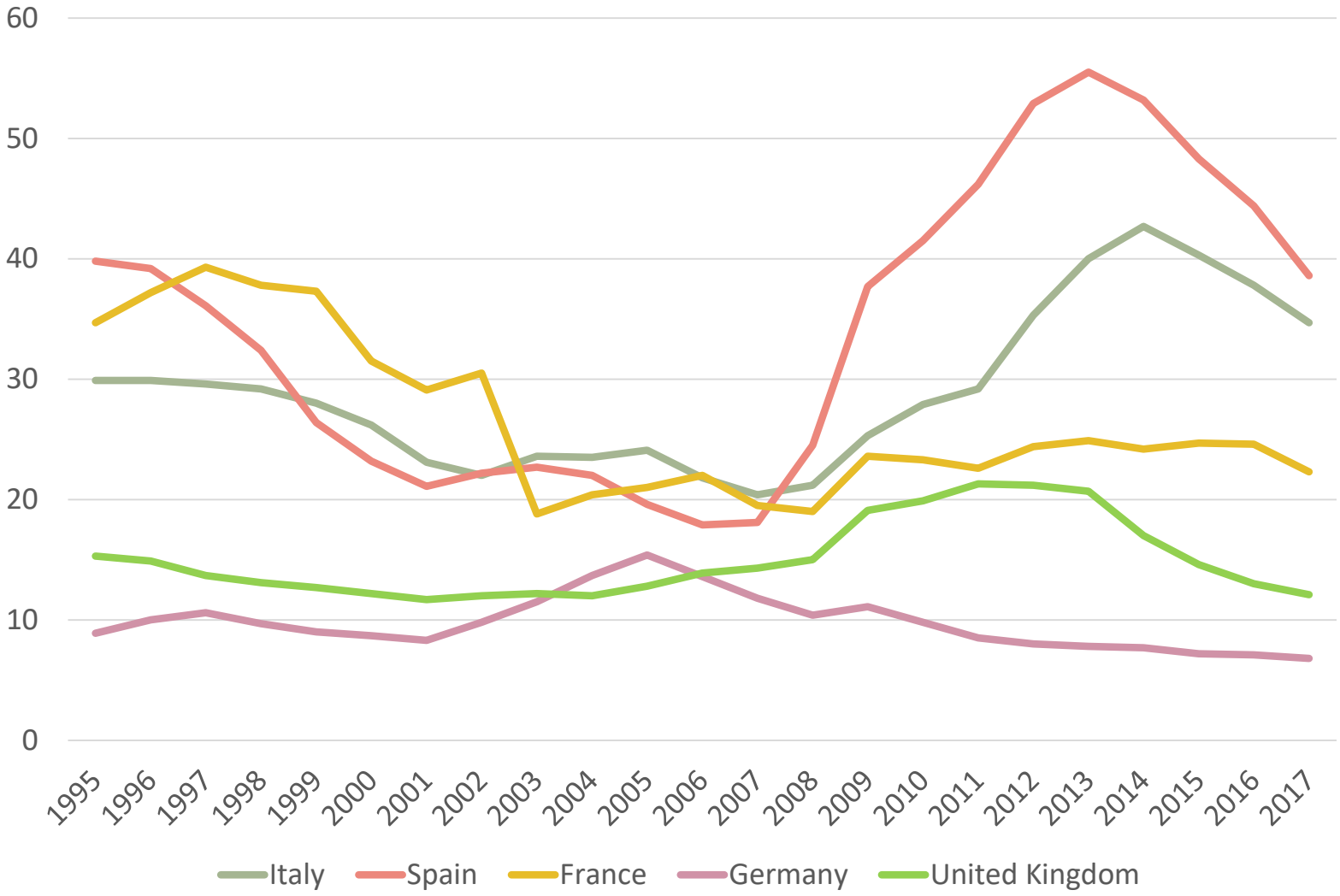
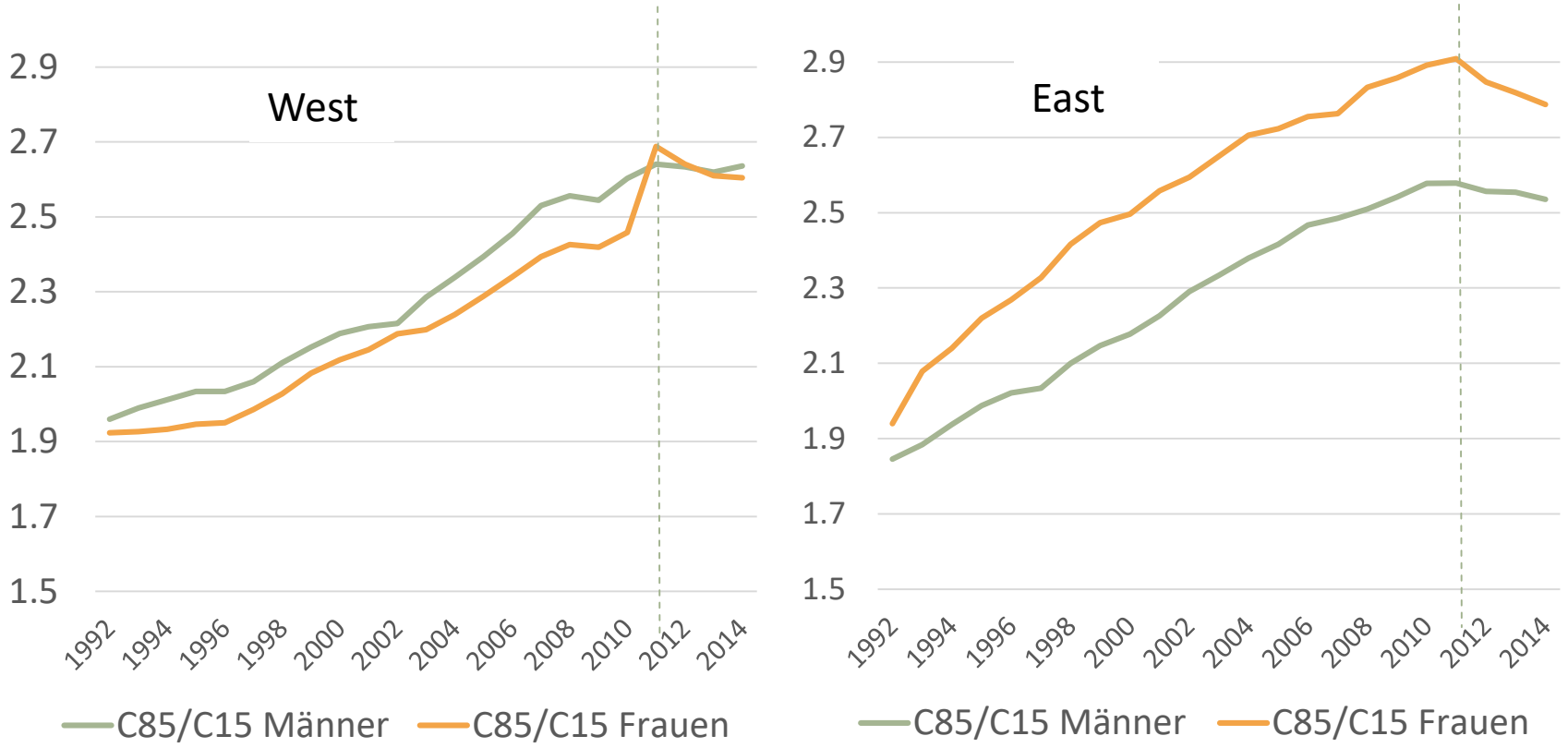
German youth unemployment rate is the lowest among the big European countries



Source: Eurostat Labour Force Survey; Presentation IAB, unemployment rate for persons of age 15-24

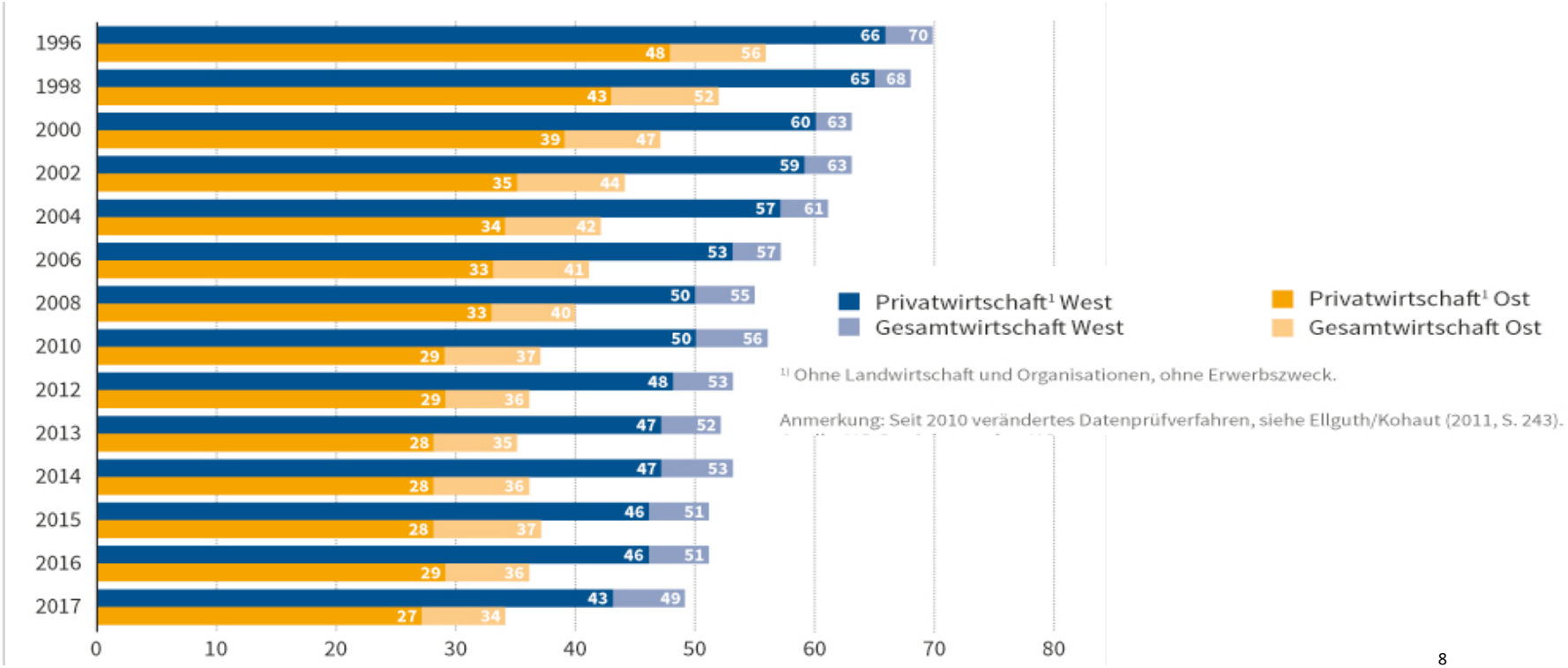
Wage inequality in Germany is rising since the mid-nineties



Verhältnis des 85. zum 15 . Perzentil für Vollzeitbeschäftigte; Datenquelle: IEB; eigene Berechnungen; die gestrichelte Linie bezeichnet eine Veränderung in der Erfassung der Teilzeitbeschäftigung, um die statistisch korrigiert wurde (siehe Möller 2016).

Union coverage is lower in the East and decling in both parts of the country

Percentage of workers covered by xollective agreements 1996-2017 by region and sextor



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Source: IAB Betriebspanel © IAB – S. Kohaut - IAB Forum 2018

Some more stylized facts about the German labor market

- Unemployment lowest for the high skilled, highest for the low skilled
- Upskilling of the labor force, increasing regional concentration of high skilled
- Moderate real wage increases in the last years
- Introduction of minimum wage (January 2015: € 8,50)
- Demography: Ageing and shrinking despite high net immigration
- Regional disparities (East/ West; North/ South)

Digitization: fascination and threat

Profound changes through digitization

Threats or opportunities?

The digital revolution is progressing rapidly...

Areas of development

Cyber-physical systems offer radically new possibilities of networking...

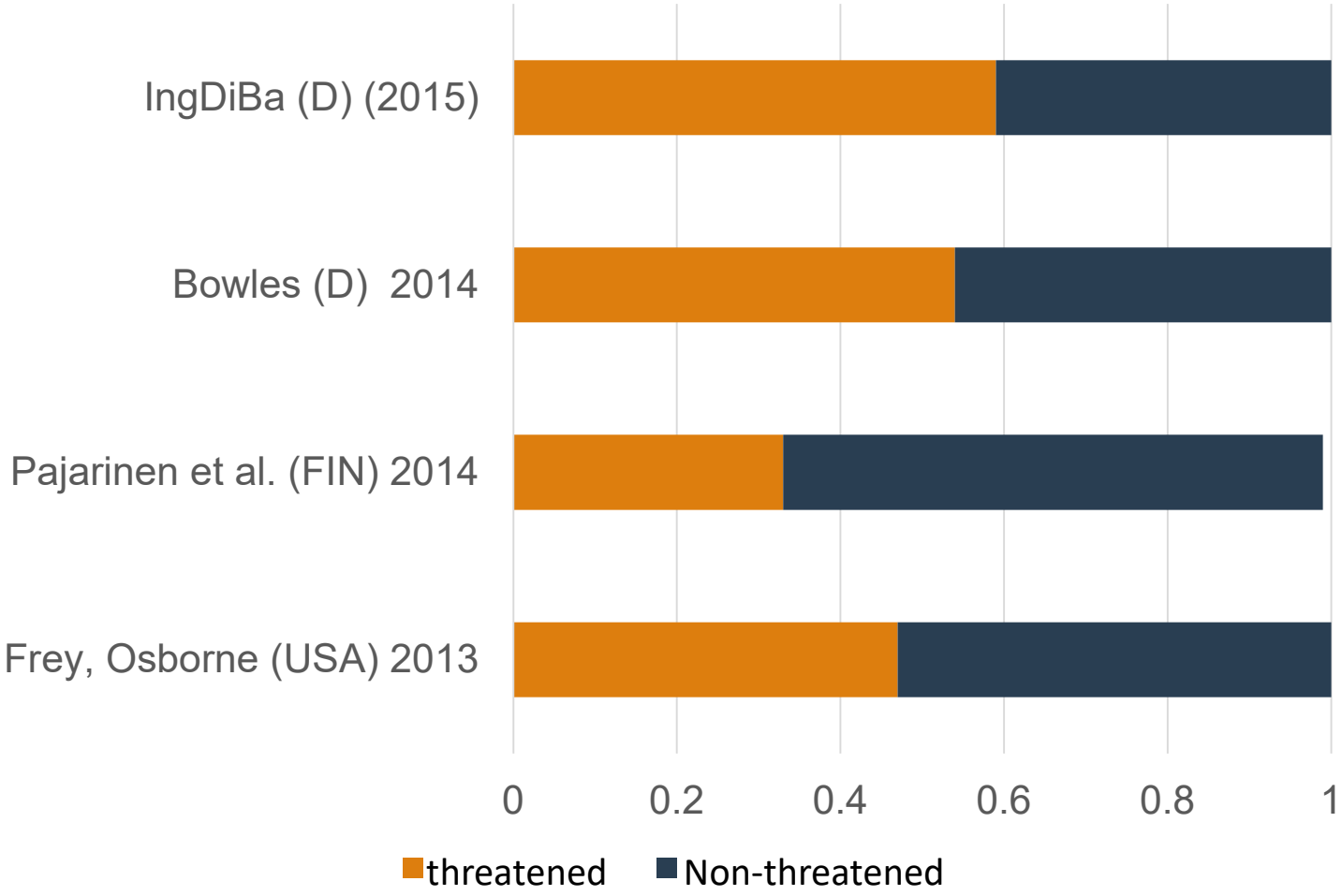
- Mobile robots, cobots
- Assistance systems, remote maintenance, 3D printing
- Platforms, e-commerce
- Artificial Intelligence, machine learning

Within companies → "Internal digitization", smart factories

Between suppliers and customers → "external digitization"

Elimination of jobs on a broad front?

Some empirical studies draw gloomy scenarios …



FUTURE TENSE | THE CITIZEN'S GUIDE TO THE FUTURE. | APRIL 28 2016 9:00 AM

FROM SLATE, NEW AMERICA, AND ASU

Slate

Killer Robots? Lost Jobs?

The threats that artificial intelligence researchers actually worry about.

362 239 28

By Cecilia Tilli

Elon Musk, Stephen Hawking, and Bill Gates .

Photo illustration by Sofya Levina. Images by Mike Windle/Thinkstock, Bryan Bedder/Thinkstock, and Joshua Lott/Getty Images.

The threating scenario of technological development

A hype in the media?

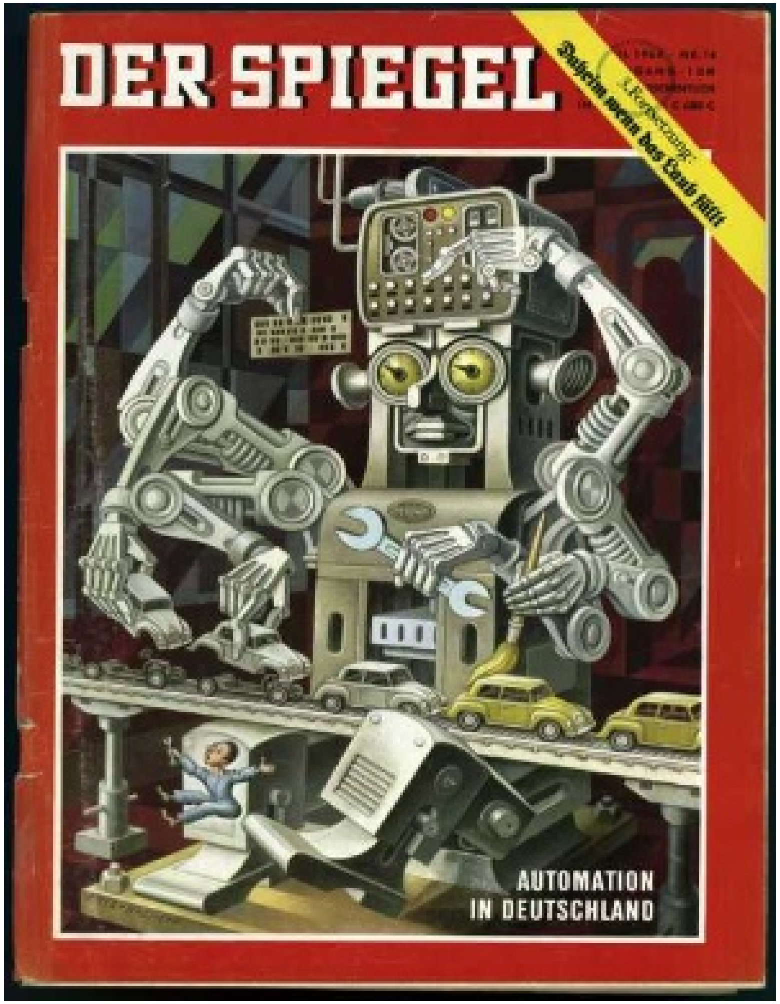
» The experts are split into two camps. Some claim that the tide is rapidly rising and 80 percent of the jobs are destroyed in 20 years. The others believe that this will happen only later.«

Der Spiegel, 17.4.1979

2016


DER SPIEGEL
Nr. 36
3.9.2016
Sie sind entlassen!
Wie uns Computer und Roboter die Arbeit wegnehmen – und welche Berufe morgen noch sicher sind
Sportarzt Müller-Wohlfahrt
Heilende Hände, aber Probleme mit den Finanzen
Eine ukrainische Karriere
Erst Gefängnis, dann Präsidentenpalast?
Steinzeit-Drama
Warum Neandertaler zu Kannibalen wurden

1964


DER SPIEGEL
AUTOMATION
IN DEUTSCHLAND

Are the threats exaggerated?

Critical assessment of pessimistic scenarios …

- Experts often overestimate the technical possibilities (author 2014)

- Technical potential is not equated with actual substitution of human labor:
  - legal hurdles (e.g. for autonomous driving),
  - cultural preferences, reservations (robot service?)
  - Profitability Hurdles

- Share of specific activities within the professions assumed to be constant → not realistic

Professions do not disappear, they are adjusting!

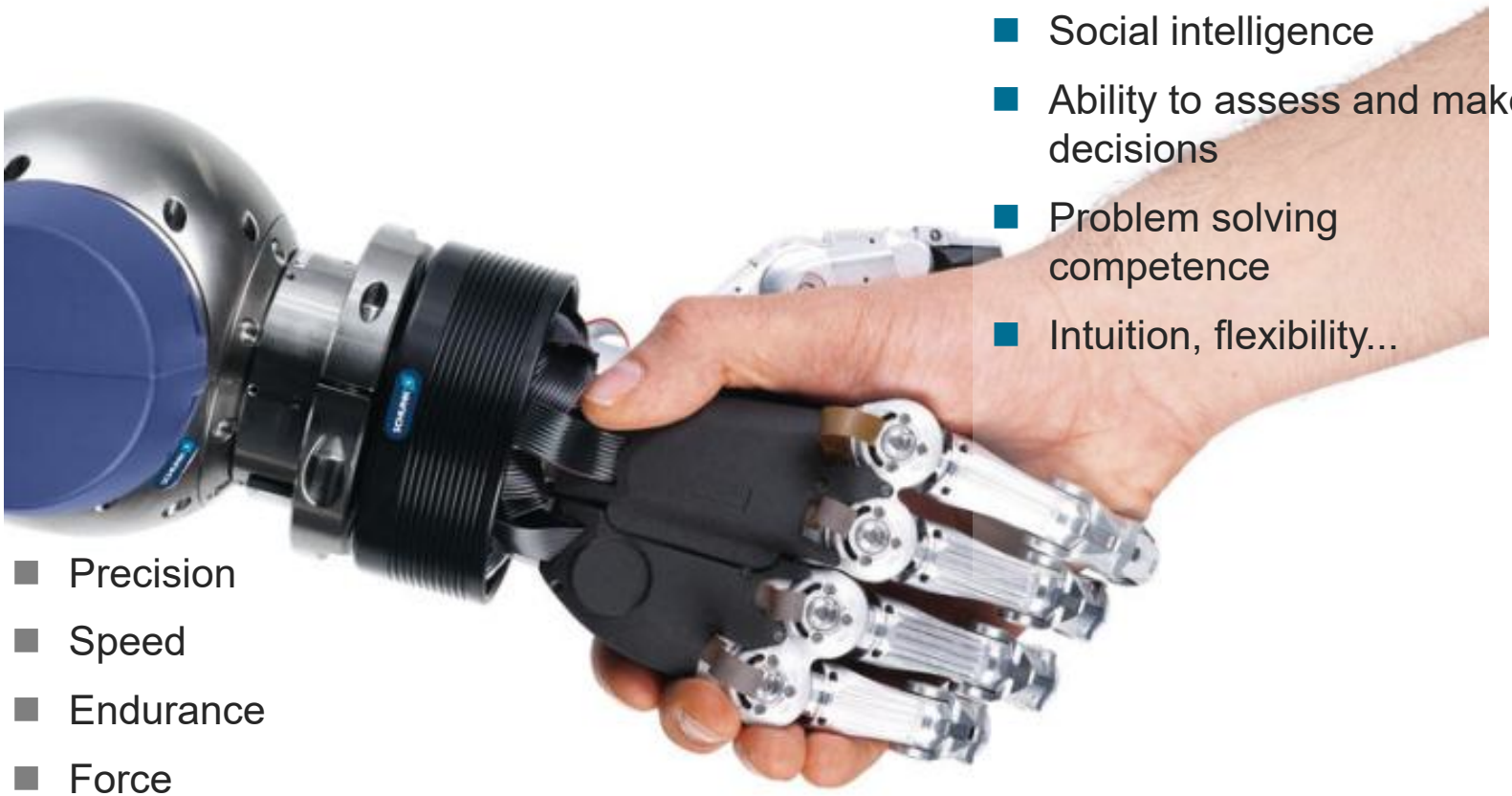
The work does not go out, but it is changing

Technological progress leads to other activities within the professions

The robots leave their cages...

Cobots are directly interacting with workers …

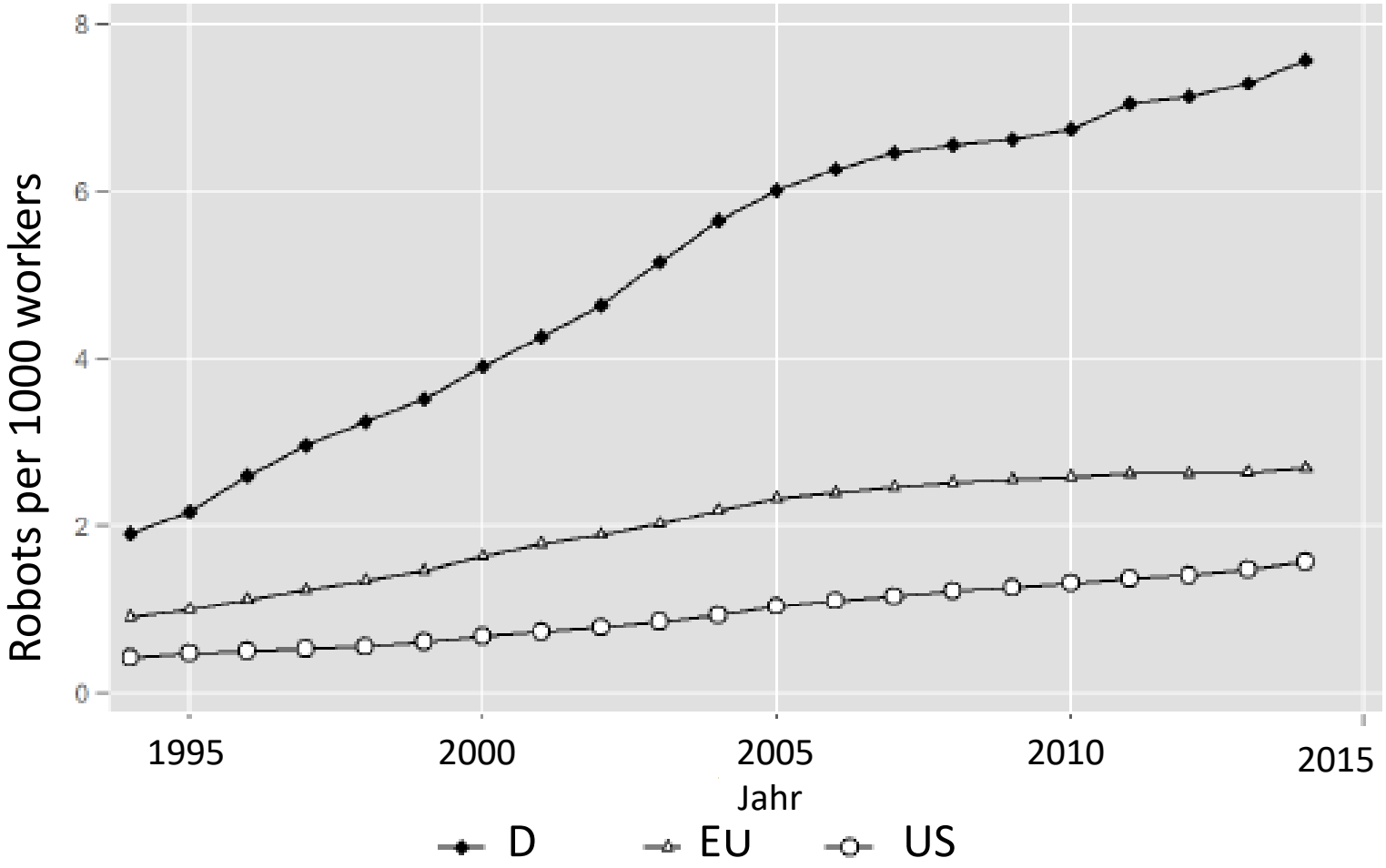
- Creativity
- Emotions, empathy
- Social intelligence
- Ability to assess and make decisions
- Problem solving competence
- Intuition, flexibility...



- Precision
- Speed
- Endurance
- Force
- Predictability
- Low maintenance costs

The use of robots increases

Germany one of the leading countries...



Source: Dauth et al., IAB-Discussion Paper 30/2017

Possible substitution of human work by digital technology

What kind of tasks can be replaced?

Main theses of Frey, Osborne (2013)

- Technical developments (mobile robots, machine learning, KI), not only displace simple standardized (routine) activities but also more complex activities!

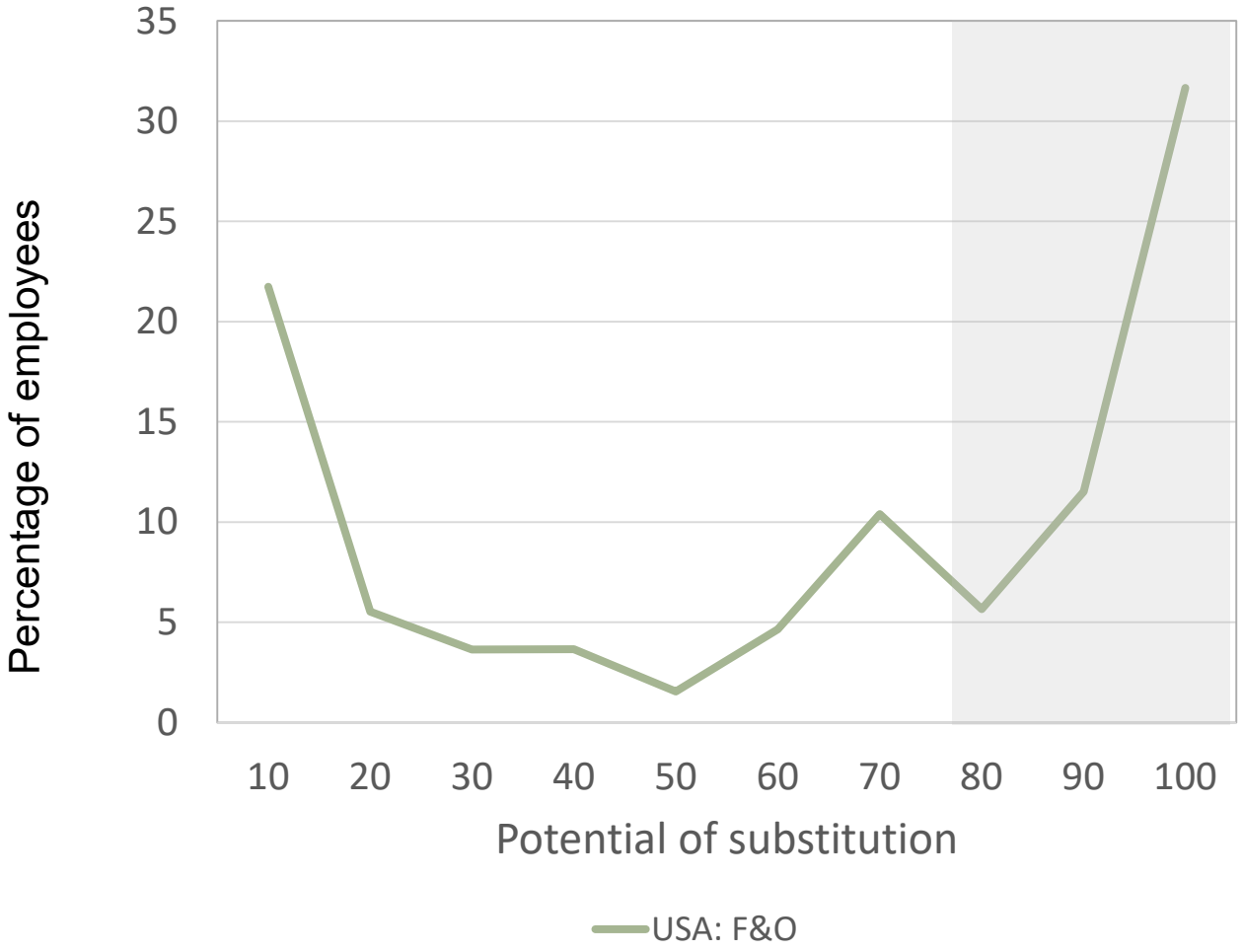
Less endangered, however:

- Activities of hand-eye coordination
- Creative-intelligent activities
- Social-intelligent activities

→Calculation of the substitutability of (current) activities in the professions

Substitutability of professions

Frey/ Osborne (2013)



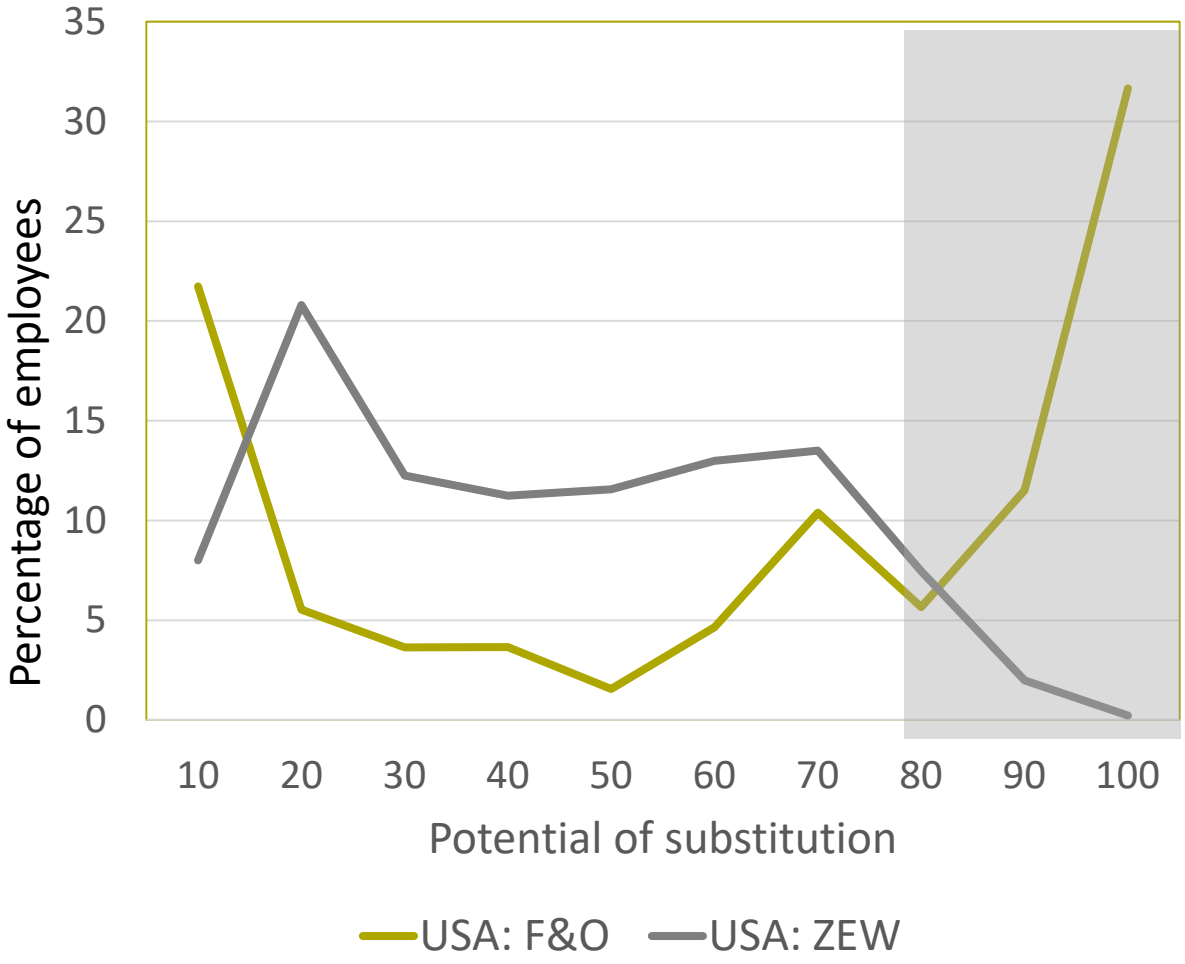
Acutely at risk (total in hatched area)

USA: : 47% of workforce (Frey, Osborne)

Source: Own presentation with data from Frey, Osborne (2013).

Substitutability on the basis of activities

Different values between Frey/Osborne and ZEW



Total in hatched area:

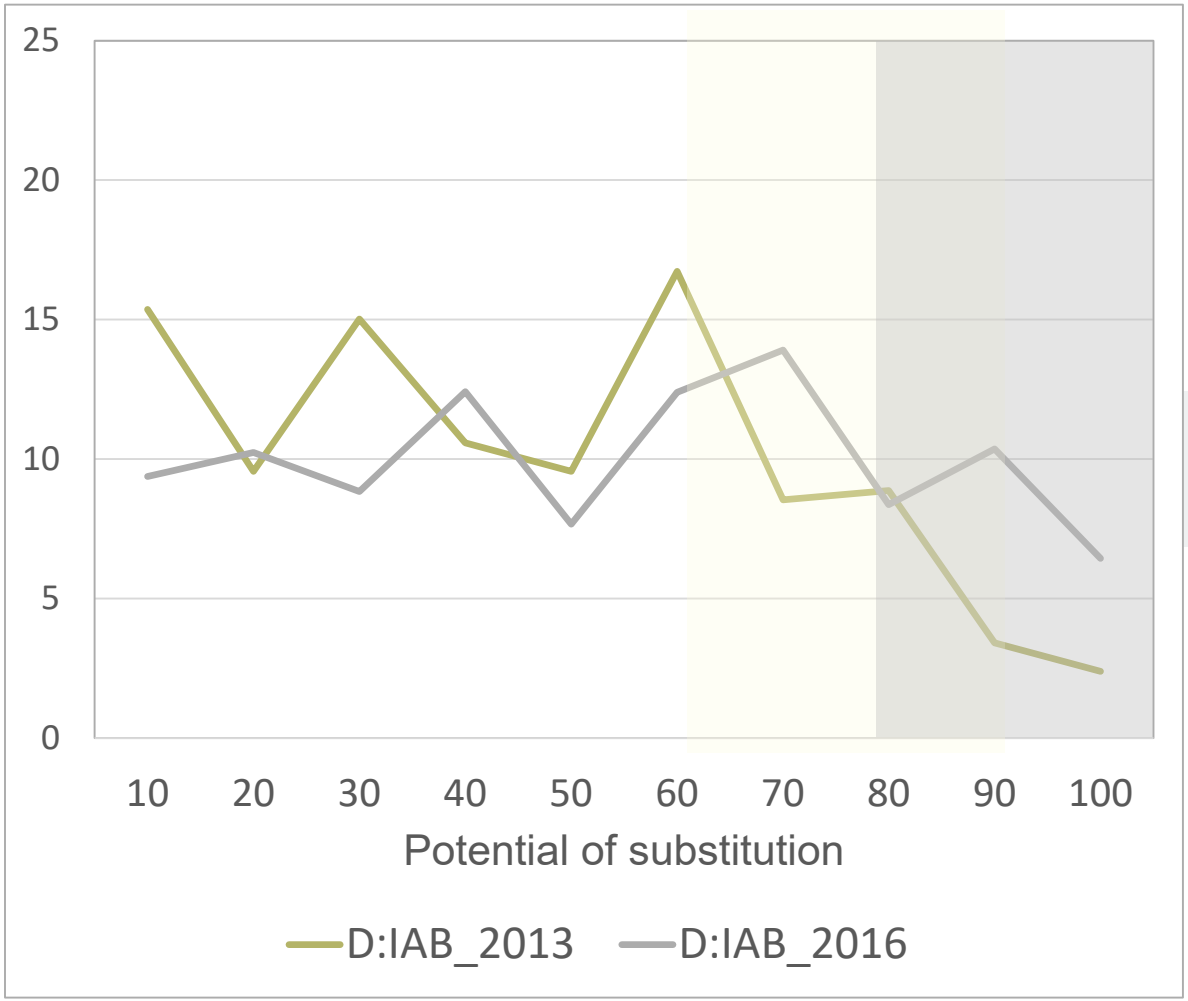
USA: F&O: 47% of employees

USA: ZEW: 10% of employees

Source: Own presentation with data from Arntz, Gregory and Zierahn (2017),Frey, Osborne (2013).

Substitutability on the basis of activities

Update: Higher values in the upper range …



Total in hatched area:

IAB_2013: 15% of employees

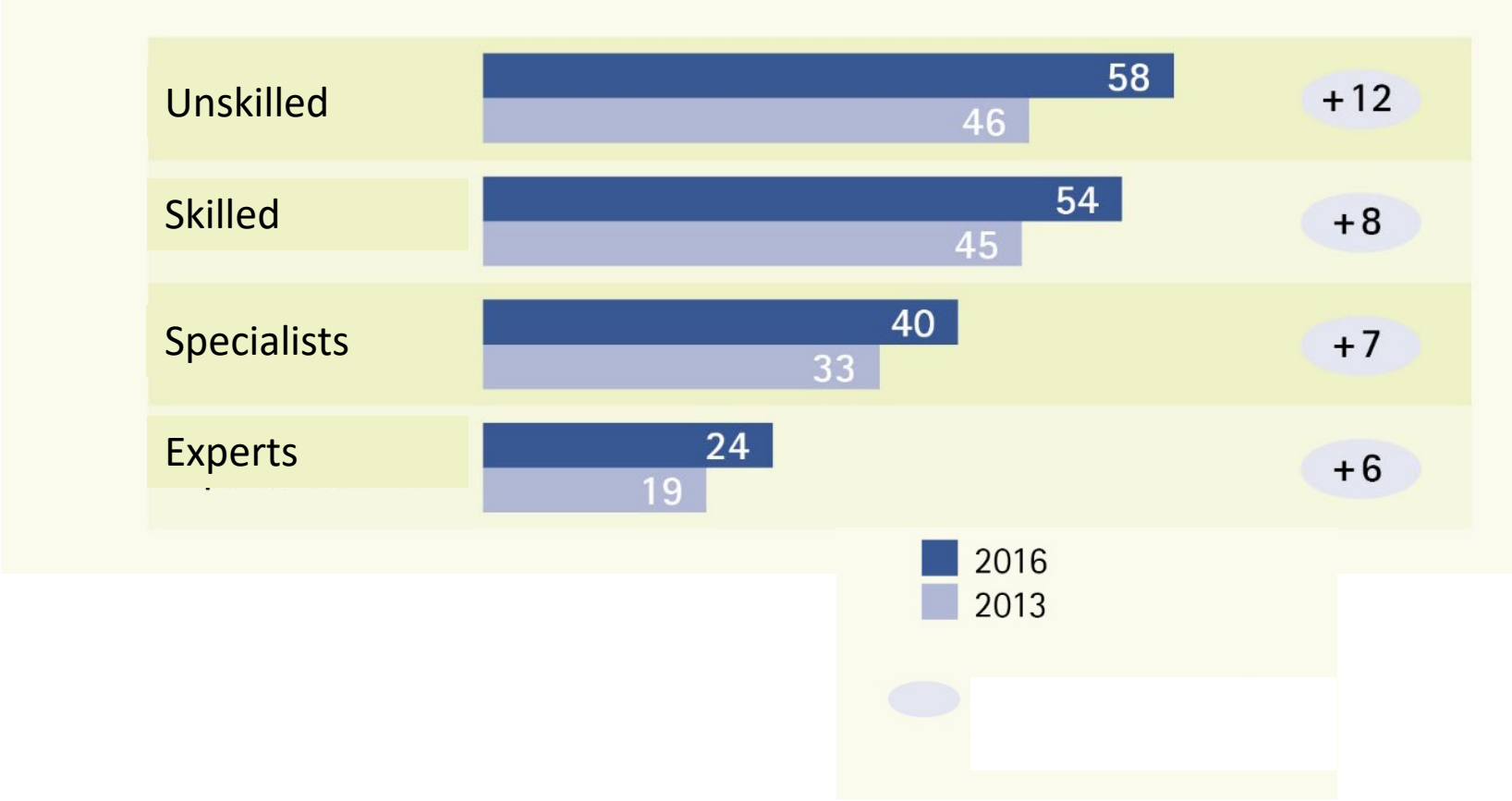
IAB_2016: 25% of employees

Source: Own presentation with data from Dengler, Matthes (2015, 2018)

Change in requirements, occupational fields and sectors

Substitutability decreases with the requirement level

Proportion of activities that can be replaced in principle today



Source: Dengler, Matthes (2018): IAB-Kurzbericht, 4/2018

Employment growth in recent years, however, indicates polarization

Highest growth rates for bottom and top requirements

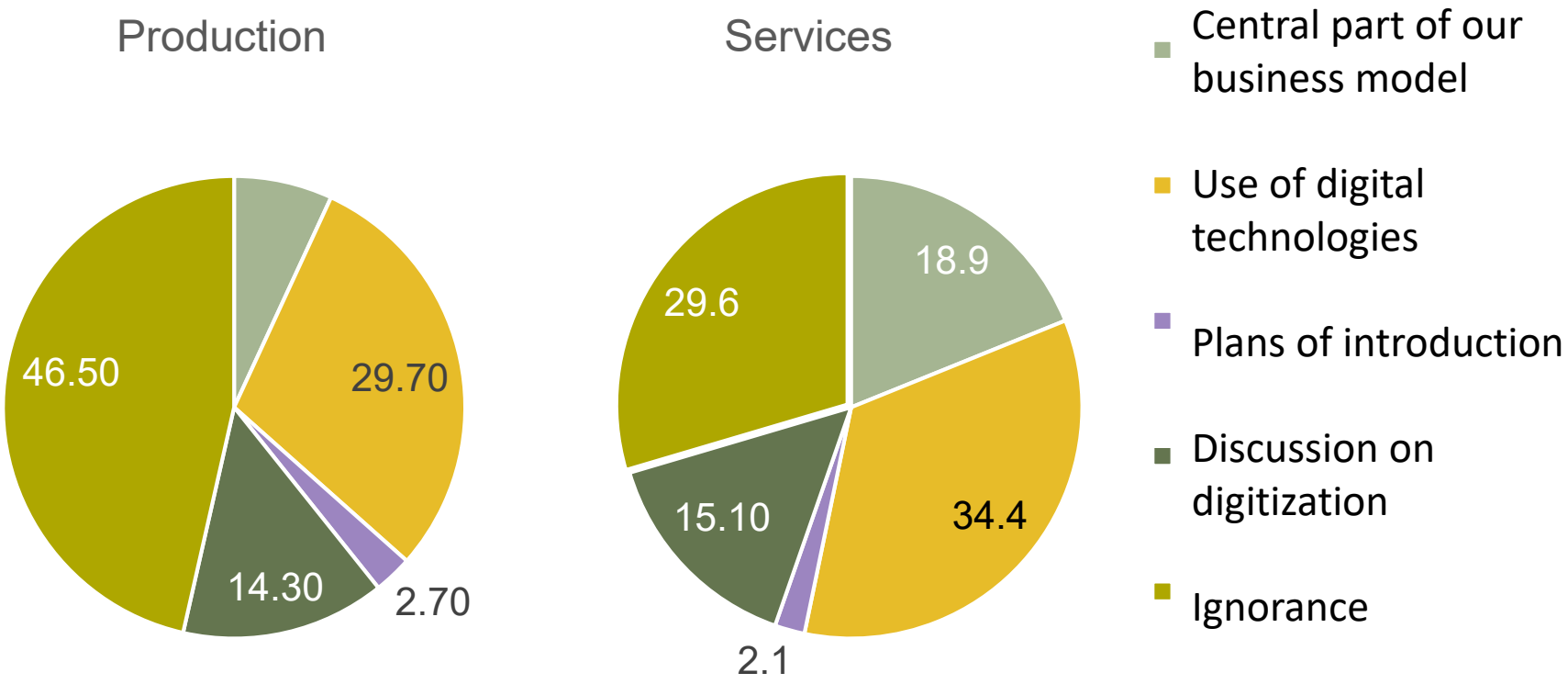
	2012	2016	Growth rate in percent
	in millions		
Unskilled	3.66	4.15	13.4
Skilled	15.25	16.13	5.8
Specialists	3.41	3.70	8.5
Experts	3.32	4.66	40.4
Total	**25.63**	**28.63**	**11.7**

Source: Own calculations with IEB data.

State of digitization in German companies

Use of digital technologies by sector

Survey in April/May 2016, percentage of shares



Quelle: IAB-ZEW-Betriebsbefragung „Arbeitswelt 4.0“, IAB Kurzbericht 22/2016

Technological unemployment

Technological unemployment

The famous definition of Keynes …

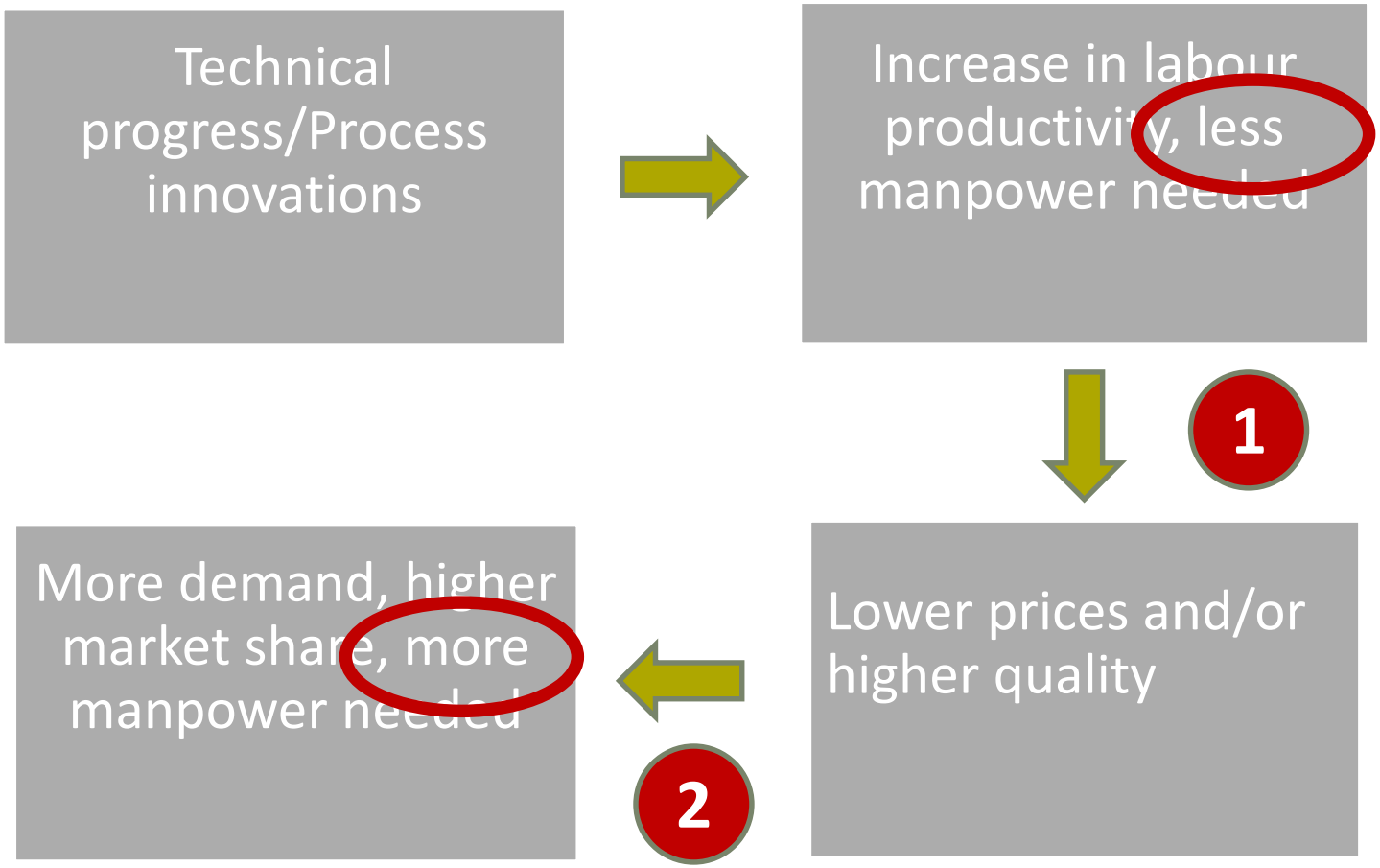
» We are being afflicted with a new disease of …– namely, technological unemployment. This means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour.«

» Those countries are suffering relatively which are **not** in the vanguard of progress.«

John Maynard Keynes:
Economic Possibilities for our Grandchildren (1930), (my highlighting)

Technical progress is Janus-headed

Effects on employment ambivalent



→ What is the net effect on employment?

What effect of technical progress?

Competition and price elasticity

	Price Elasticity of demand	Competition	Employ-ment effect
New Products/ Competitive markets	High	High	Positive
New Products/ Markets with low competition	High	Low	(Positive)
Old Products	Low	High/ Low	Negative

Other arguments for employment gains

Product Innovations, Reshoring

- Technology creates new services and products (product innovations) → positive employment effects
- *Reshoring*

Higher unemployment through digitisation?

e.g. Korinek, Stiglitz (2017)

Assumption: digitization leads to more fluctuation between companies/sectors/regions

→ higher separation rate → higher unemployment in equilibrium

Assumption : digitization leads to devaluation of specific human capital

Consequence in imperfect labor markets:
higher unemployment in equilibrium

Conclusion: tending to increase unemployment possible, but a second order effect!

Technological unemployment through digitisation

A counter position

» The idea that people would always have a unique ability that is unattainable for non-conscious algorithms is pure wishful thinking.«

Yuval Noah Harari: Homo Deus, 2017,S.430f.

A recent plan: robots producing robots …

Only marketing or revolutionary production technique?

ABB to build the world's most advanced robotics factory in Shanghai

Milestone investment will combine connected digital technologies, state-of-the-art collaborative robotics and cutting-edge artificial intelligence research to create the most sophisticated, automated and flexible Factory of the Future.

Source: https://new.abb.com/news/detail/9410/abb-to-build-the-worlds-most-advanced-robotics-factory-in-shanghai

The productivity puzzle

Technology and productivity

Is there a puzzle?

»You can see the computer age everywhere but in the productivity statistics.«

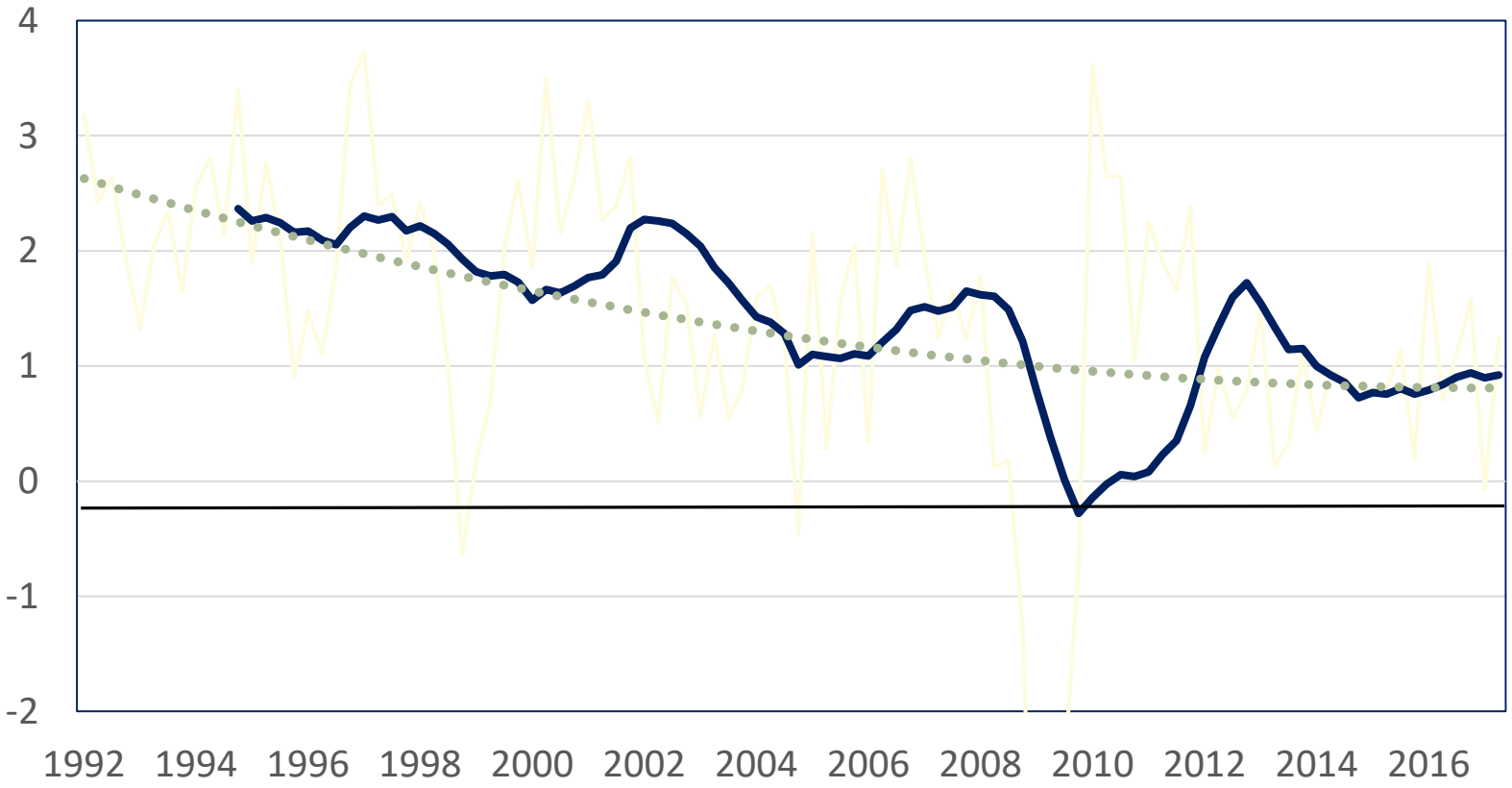
Robert Solow 1987

» ... measured productivity has increased rather slowly in recent years, even as the world seems to be captured by AI (Artifical Intelligence) fever.«

Anton Korinek ,Joseph E. Stiglitz (2017)

Productivity growth per hour

Decline and stabilization at low-level



Own presentation with data of the Bundesbank; Growth rate vs prior-year quarter; 3-year moving averages and polynomial trend.

Artificial Intelligence as a new basic technology

Approaches to explaining the productivity puzzle

E. Brynjolfsson, D. Rock, C. Syverson (2017):
Basically four possible explanations for the productivity puzzle:

- Higher expectations
- Measurement problems
- Distribution effects (zero-sum games)
- Implementation delays (J-Curve effect)

Favored: The J-curve effect: effects only after complementary innovations and investments; these are often incomprehensible (intangible); e.g. adjustments, organizational changes, qualification in advance)

Digitization and distribution

The distribution problem

Digitization exacerbates inequality

- Outstanding importance of cutting edge technology, extreme scale yields
- Markets (Big four of the digital economy)
- "The winner takes it all"-structures
- Segmentation of companies (polarized structure: "Lovely and lousy jobs")
- Selection of highly productive workers in good companies, less productive in bad companies (card, Heining, Kline, QJE 2013)

New start for wealth formation?

Redistribution of property rights instead of redistribution of income

» As companies substitute machines and computers for human activity, workers need to own part of the capital stock that substitutes for them to benefit from these new "robot" technologies. … Without ownership stakes, workers will become serfs working on behalf of the robots´ overlords.

Richard Freeman (2015), meine Übersetzung

Conclusions

Conclusions

Opportunities and risks of digitization

- Significant drop in labor demand rather unlikely but stronger structural change
- Professions will generally not disappear, but the job content is changing; Increased training efforts needed!
- Adaptation requirements between qualifications, professions, companies and regions
- Technological unemployment tends to be a second-order problem; Interaction with demographic change barely investigated
- Distribution consequences, however, likely a first-order problem!

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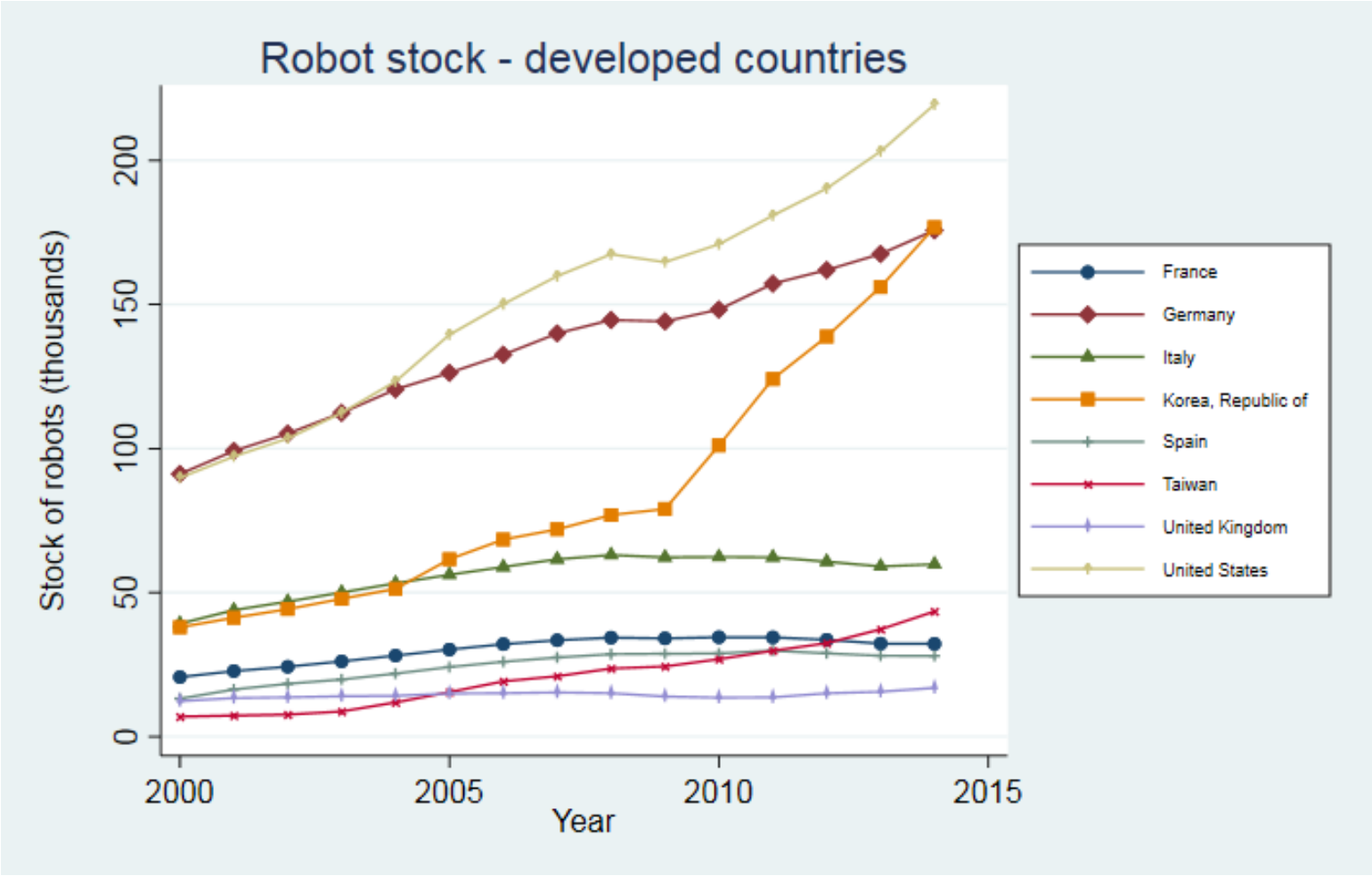
Robot stock (developed countries, excl. Japan)

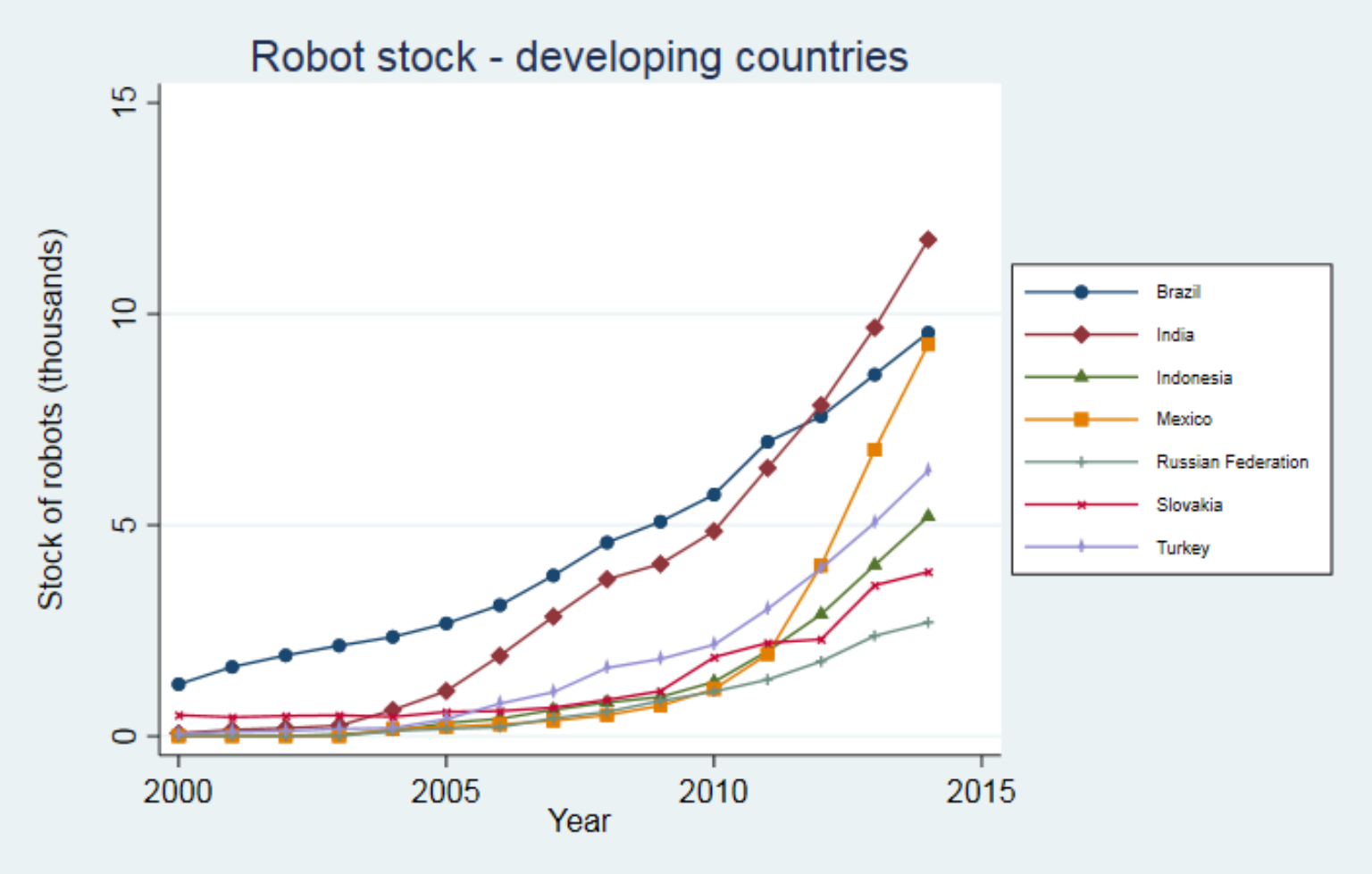
High dynamics in US, Korea, Germany



Source: Carbonero, Ernst, Weber (2018), Robots worldwide: The impact of automation on employment and trade, Ilo Working Paper # 36-

Robot stock (emerging countries, excl. China)

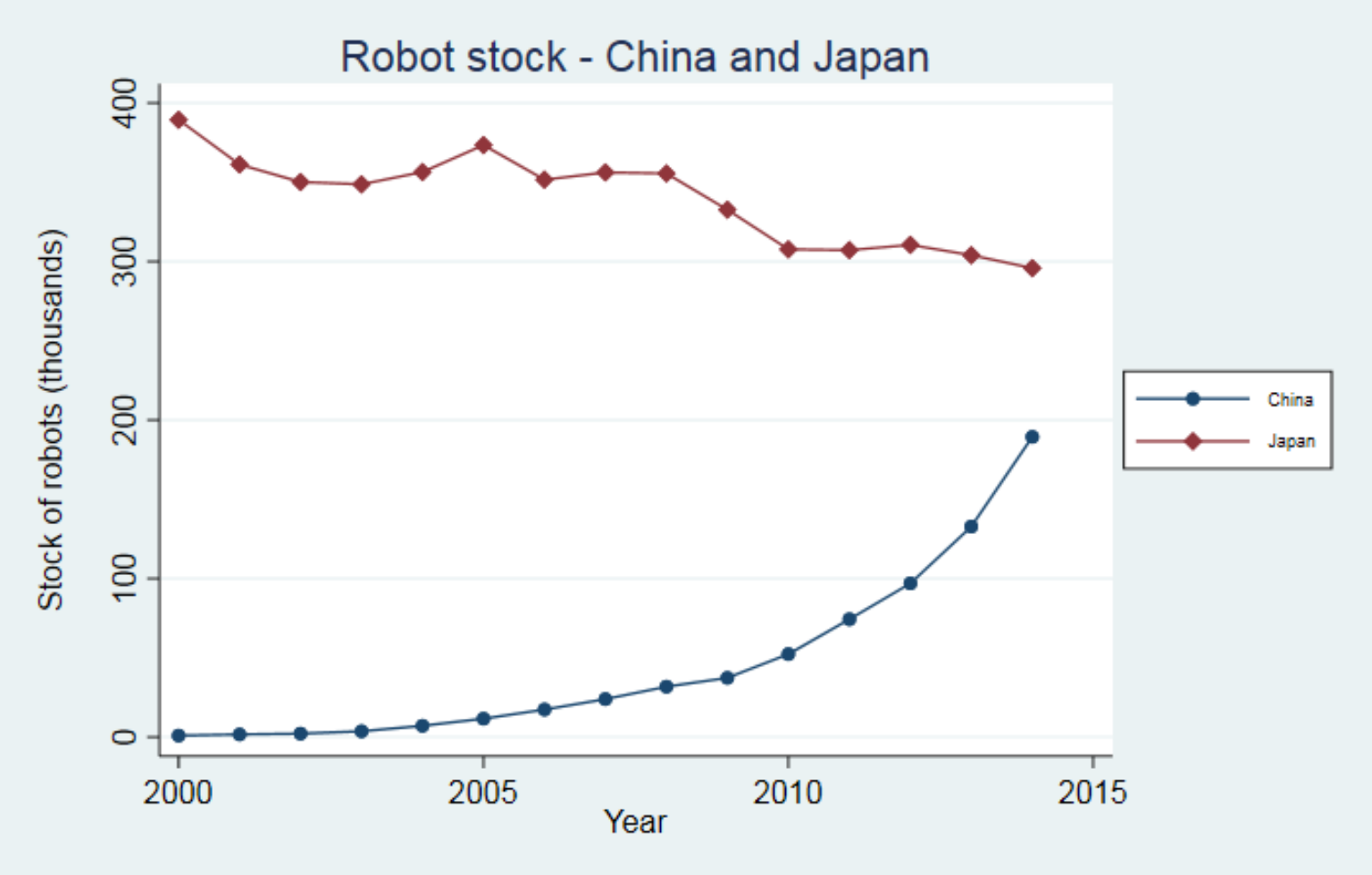
High dynamics in several countries



Source: Carbonero, Ernst, Weber (2018), Robots worldwide: The impact of automation on employment and trade, Ilo Working Paper # 36-

Robots: Japan vs China

Exponential growth in China



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